



The Gold Inlay.*

Dr. J. V. CONZETT.

In making an inlay for a cavity occurring in the proximal surface of an incisor, the cavity should ordinarily be approached from the lingual surface. The only exceptions to this rule would be in those cases in which the decay has so penetrated the tooth from the labial surface that it has made a sufficiently large opening from that surface, and the lingual surface is practically intact; in such a case it would be folly to cut an approach from the lingual, for the labial surface has already been destroyed, and there would be no reason for cutting an entrance from the lingual. The other exception would be in those cases of mal-occlusion in which the teeth are so placed that it would not be possible to make an entrance from the lingual surface without destroying a large portion of the tooth.

The entrance is made from the lingual surface for the purpose of hiding the gold as much as possible, and for the further reason that an inlay inserted from the lingual surface receives the stress of mastication in such a direction that the stress has a tendency to drive the inlay into the cavity instead of out of it, thereby insuring a greater permanency to the work.

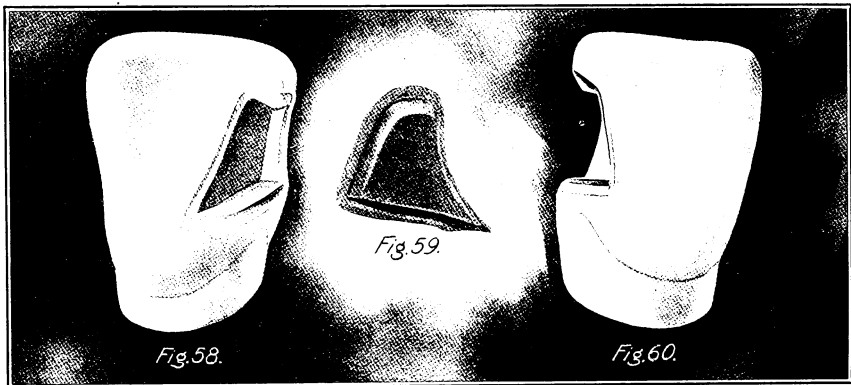
Proximal Cavities in Incisors.

When the case presents, and the inlay is decided upon, the cavity is opened from the lingual surface with a chisel, breaking down the enamel walls until an entrance to the cavity proper is obtained. Then the decay should be removed with a spoon excavator,

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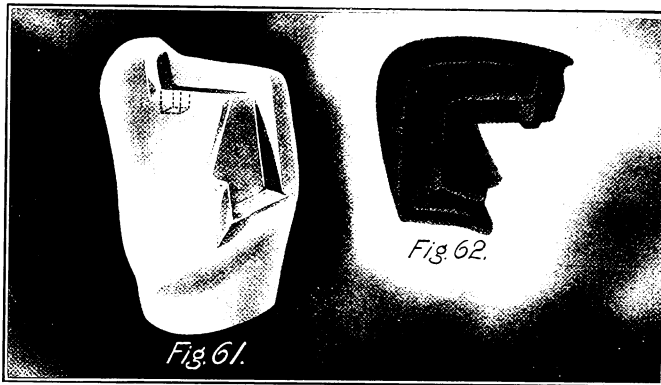
and the extent of the carious involvement definitely ascertained. Now take a dentate inlay bur No. 5, and place it in a contra-angle hand-piece, and from the lingual surface cut a cavity of the orthodox box shape as nearly as the shape of the tooth will permit. The seat of the cavity in the case of one of this kind will be the labial surface of the tooth, and this should be as flat as is consistent with the conditions met with in this situation. The axial wall should be cut at right angles with the seat of the cavity, and the gingival and incisal walls slightly grooved that the finished inlay may have a resistance against lateral displacement. The



labial wall will be cut as far back as is consistent with the safety of the involved tissue, but no further than the strength of the tooth demands. Extension for prevention in this position does not demand extensive cutting; simply enough to bring the margins clear of proximal contact, so that if there is no great carious involvement there need be no great display of gold. If possible, leave as much dentine as you can between the labial plate and the inlay, for, if not, the cement will show through the translucent enamel and make an unsightly appearance. The cavo-surface angle should be carefully beveled, and the bevel upon the labial wall should be so made that it will allow the wax to withdraw without distortion. This can easily be done, and at the same time afford sufficient protection to the enamel rods. The cavity in Figure 58 will illustrate a simple cavity in the proximal surface of an incisor, the entrance of the cavity being from the lingual surface, as indicated in the foregoing text. A labial view of the same in Figure 60 will illustrate the amount of extension that is usually necessary in the ordinary case in practice. Figure 59 shows the inlay for this cavity.

**Proximal Cavities
Involving
Incisal Angle.**

In cavities involving the incisal angle there are two methods that may be utilized in their preparation for the reception of an inlay. The first one shown is a modification of the step cavity used by the disciples of Dr. Black and his followers. In this preparation the incisal angle is cut down with a flat stone until the required labial depth has been secured. The proximal portion of the cavity is prepared with a flat gingival seat and axial walls that are as nearly parallel as possible. In the case of an incisor, as in that of a cuspid, the nature of

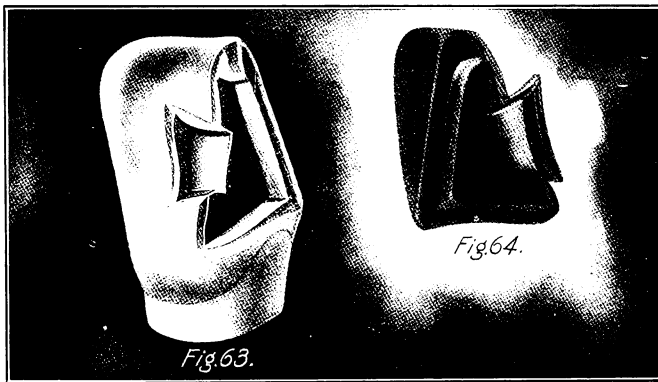


the shape of the tooth will necessitate the running out of the cavity, of one of the axial lines before the incisal portion of the tooth has been approached, and, as in case of the same class of cavities that were illustrated for the restoration of the cuspids, we will choose to leave the cone of the tooth in the lingual surface for esthetic reasons, and by reason of the fact that the irregular cone shape of an incisor makes such a procedure the natural one. The labio-axial line will reach in a straight line from the gingival surface of the cavity to the step that has been cut in the incisal portion of the cavity, as illustrated in Figure 61, which will also show the point at which the lingual axial line leaves the cavity. At this point, as will be observed, a lingual step is, of necessity, made, and the enamel walls at this region are beveled. The dentine in the incisal portion of the cavity is grooved as deep as is consistent with pulpal safety, and this groove is carried over toward the pit or "well" that is made in the dentine on the farther side of the median line, far enough to escape inadvertently exposing the pulp (Figure 61). This deep pit, or well, is made necessary by reason of the fact that it is not possible, in the preparation of a cavity for the reception of an inlay, to make any

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gingival retention, and, as a consequence, there will devolve a much greater strain upon the incisal retention, and it must therefore be made correspondingly deeper and stronger. There have been a number of failures in this class of cavities that have come to my notice, for the reason that not sufficient attention has been given to this aspect of the case. The cavo-surface angles are to be beveled all around the cavity, as in all cases that we have considered. Figure 62 will illustrate the inlay for such a cavity.

There are times when this sort of a cavity does not appeal to the

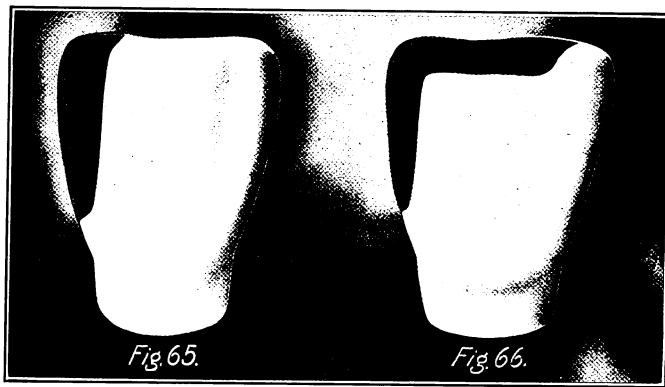


sense of the beautiful, if it ever does, and we earnestly wish that some other method might be possible. In accordance with that wish I have frequently inlayed this class of cavities in the manner that we will now consider, very much to my satisfaction and the delight of the patient, and, as the permanency of the operation now seems to be assured, I have no hesitancy in giving it to the profession.

Author's Method for Similar Cavities.

In the preparation of a cavity along this line, there is no cutting of an incisal step. Instead the cavity is cut from gingival to the incisal portion of the tooth as little as is consistent with the strength of the tooth, and as much of the enamel wall left as is protected by sound dentine. This, of course, for esthetic reasons. The cavity is prepared from the lingual surface, and the instrument that is the dominant one, in such preparation, is the contra-angle hand-piece with the chisels of various shapes and sizes. The gingival seat is made flat in the orthodox way that we are now all accustomed to, and the cavity squared out from the lingual surface in such a manner that the inlay will draw from the lingual surface. The labial surface in this preparation is

made the seat of the cavity and, in consequence, should be formed as flat as it is possible to make it. After we have made a cavity in accordance with this idea, with a fissure bur in the contra-angle hand-piece, a dovetail cavity is cut into the lingual surface of the tooth connecting with the cavity, and so made that when the inlay that is to fit such cavity is in place it will be impossible to dislodge it laterally, and the only way that it can be removed from the cavity is towards the lingual surface. As we know that all of the stress that comes upon a filling in the proximal surface of an upper incisor falls upon the lingual surface, and drives the



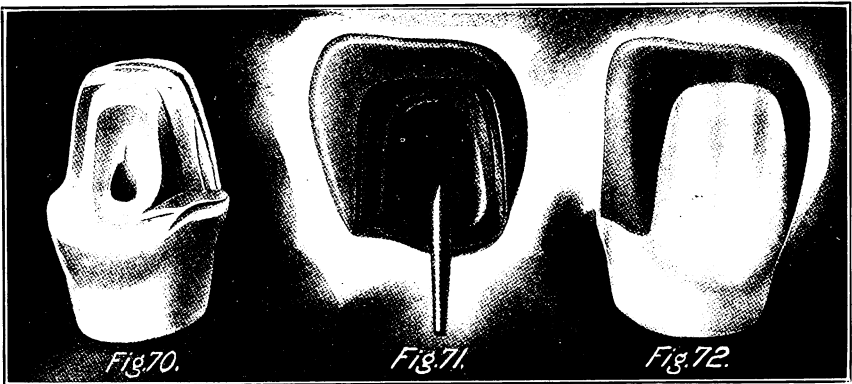
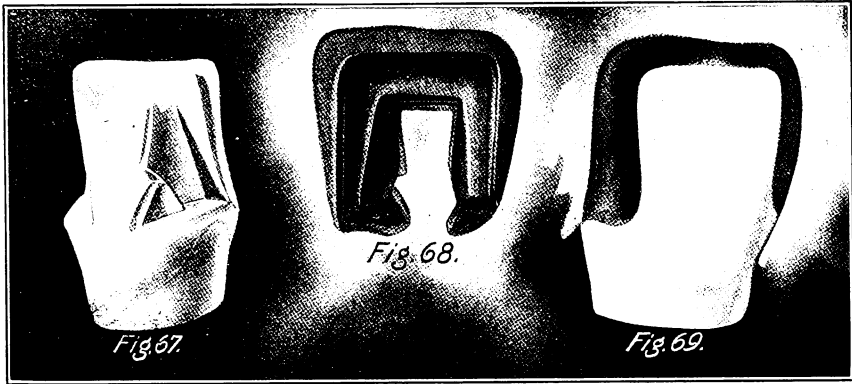
filling toward the labial surface, we see at once that a preparation of this sort is very rational. It is not only rational, from a theoretical standpoint, but is good practice from a clinical aspect, as I very well know, for I have had time to sufficiently try it out. It not only accomplishes the work for which it is intended better than the old incisal anchorage in my practice, but is infinitely better to look upon, and, at this stage of the history of esthetics, that is something. Figure 63 illustrates the lingual aspect of such a cavity, and Figure 64 the inlay. Figure 65 shows the labial view of the same with the inlay in place, in order that the beauty of the inlay may be demonstrated alongside of the inlay in the step cavity shown in Figure 66, which is the labial view of Figure 61.

**Mesial and
Distal Cavities
in Incisors.**

When the mesial and the distal surfaces of an incisor are badly involved, it becomes necessary to protect the incisal portion of the tooth, because the extreme involvement of the distal and mesial surfaces of the tooth so weaken it that the incisal portion would not be strong enough to bear the stress that would be brought to bear upon it, without the aid of the filling. It will be necessary, there-

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fore, to so shape the cavity that the finished inlay will protect the weakened incisal portion of the tooth. The cavities in the mesial and distal surfaces should be prepared as though the cavities were to be of the simple step variety, except that the walls, as they approach the incisal portion of the tooth, should converge toward the median line. This is for the



purpose of being sure that the compound inlay will draw. If the axial walls were to be made perfectly parallel they would draw, but the slightest divergence from the parallel in the direction of a divergence of the lines of the cavity incisally would be fatal to the withdrawal of the wax or the insertion of the finished inlay. Therefore, it will be best to be on the safe side, and cause the axial lines to slightly converge incisally. The incisal portion of the tooth should be ground off as much as necessary to insure sound tooth tissue, but should always be cut more lingually than labially for esthetic reasons. The incisal portion of the cavity may be

slightly grooved, if desired, but it is not necessary, because sufficient strength can be given the inlay by making proper lingual extension. The cavo-surface angles should all be beveled, and the labial plate should be so beveled that the finished inlay will lock it to place, and prevent its being broken off during some particularly heavy stress coming upon it.

Figure 67 illustrates the cavity from the linguo-incisal aspect, which will show the convergence of the axial lines incisally, and Figure 68 shows the inlay, while the next illustration (Figure 69) will show the labial aspect with inlay in place.

When the pulp has been involved, and the tooth has been very badly decayed, so that only a portion of the tooth is left, but the labial plate is still fairly intact, one feels that he does not like to resort to a crown, and in such a case the gold inlay is beautifully indicated for the restoration of the tooth. After the treatment and filling of the root, the body of the tooth is so prepared that an inlay will draw, being careful to preserve as much of the tooth as possible, and then the canal is reamed out for the reception of an iridio-platinum pin, which is inserted, and inlay wax built up around it, when the whole is chilled and withdrawn, and when cast makes a strong and fairly good looking restoration of the tooth. Figure 70 illustrates such preparation and Figure 71 the inlay restoration. Figure 72, the finished inlay cemented to place.

**Pulpless
Incisors.**

Dental Radiography.*

By HOWARD R. RAPER, D.D.S.,

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CHAPTER VI.

Reading Radiographs.

Seeing things is truly a mental effort. Though an object or shadow be reflected on the retina of the eye, it is not "seen" unless it has an effect upon the brain. When we say, "train the eye" to see such and such a thing, we mean really, train the mind—the brain.

To correctly read a radiograph, to see all there is in it to be seen, and to understand it to mean what it stands for, requires experience and an intimate knowledge of the anatomy and pathology of the parts under observation. Experience is an important factor. Upon looking over old negatives, I see many things of interest in them now which I did not observe a year ago.

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Illuminating Boxes.

It is always advisable to study the negative in preference to the print. Some of the finest details are lost in the print. The negative may be held up to a window or an artificial light, or it may be placed in an illuminating box (Fig. 122) for observation.

While the illuminating boxes on the market are suitable for studying large plate or film negatives, they are needlessly large and poorly adapted for studying the small, dental, film negatives. A small illuminating box

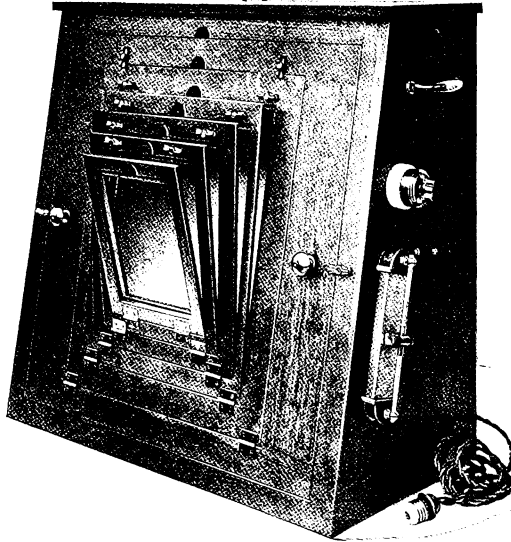


Fig. 122. An Illuminating Box.

can easily be made. A light-proof box, with a window of frosted glass and a light inside, may constitute the illuminating box. It is well to paint the inside of the box white, so increasing its power of illumination. With the negative held against the frosted glass of the window on the outside and the light lit inside, one is able to study the negative to great advantage. Little spring steel clips, similar to the ones used to hold a slide on a microscope, may be used to hold the negative against the frosted glass window.

The use of a reading glass in connection with an illuminating box will enable one to observe the negative to the best possible advantage.

The Relative Values of Dense Areas in Negatives.

The denser the part, the deeper will be the shadow thrown on the film, and, consequently, the more transparent the negative in that region. Thus in the negative, metal fillings, posts and metal crowns appear as transparent areas; gutta-percha, cement,

enamel and porcelain a little less transparent; then in the order of their respective densities, dentin, bone, gum tissue, and, last, the cheek appears—when it is shown in the negative at all—as the least transparent part, except that part of the negative on which the X-Rays have fallen directly without anything intervening except the black paper of the packet. The contrast between tooth and bone tissue is very marked. Unfilled canals and pulp chambers appear as dark streaks and areas in the teeth. Filled canals and pulp chambers appear light. Pulp stones appear as lighter spots in the dark of the pulp canal or chamber. Abscess cavities appear as dark areas. It is easy to distinguish enamel from dentin, and the peridental membrane can clearly be seen as a dark streak following the outline of roots. A bit of calculus in the peridental membrane will appear as a light spot. This calculus must be on either the mesial or distal side of a root to be seen. It could not be radiographed if it occurred on the buccal, or labial, or lingual.

**Negatives, Prints
and Half-tone
Reproductions.**

All the foregoing may be seen in good negatives, but all this cannot be seen in prints and half-tones. I recall distinctly having read an article on Dental Radiography in which the writer printed a half-tone and told his readers to “observe the enamel, the dentin and the peridental membrane.” The writer of this article wrote his paper with either a negative or a good print before him, and assumed that all he saw there would be reproduced in the half-tone. It was not. The half-tone was so dark that all detail of the picture was lost, and the best that could be done was to distinguish between bone and tooth structure. Let us stop to consider the steps in the making of a half-tone picture and the chance for the loss of detail is apparent. From the negative a new picture is made on photograph paper, the print. From this another picture is made on a half-tone plate, and from this the half-tone picture is printed on paper with ink.

The finest details of a negative cannot be shown in a half-tone, and, though I have seen many prints that seemed to have fully as much detail as the negative, there is usually at least a slight loss of minute detail even in well made prints.

I have stated, that in order to make a half-tone picture it is necessary first to make a photographic print or picture from the negative, then, from this, to make the half-tone picture. Thanks to the efforts of Dr. Ottolengui and his co-workers, I am able to print half-tones made directly from negatives. The difference in the appearance of a half-tone made from a negative and one made from a photographic print is shown in Figure 123 (made directly from the negative) and Figure 124 (made from the photographic print, but reversed in the process for easier comparison).

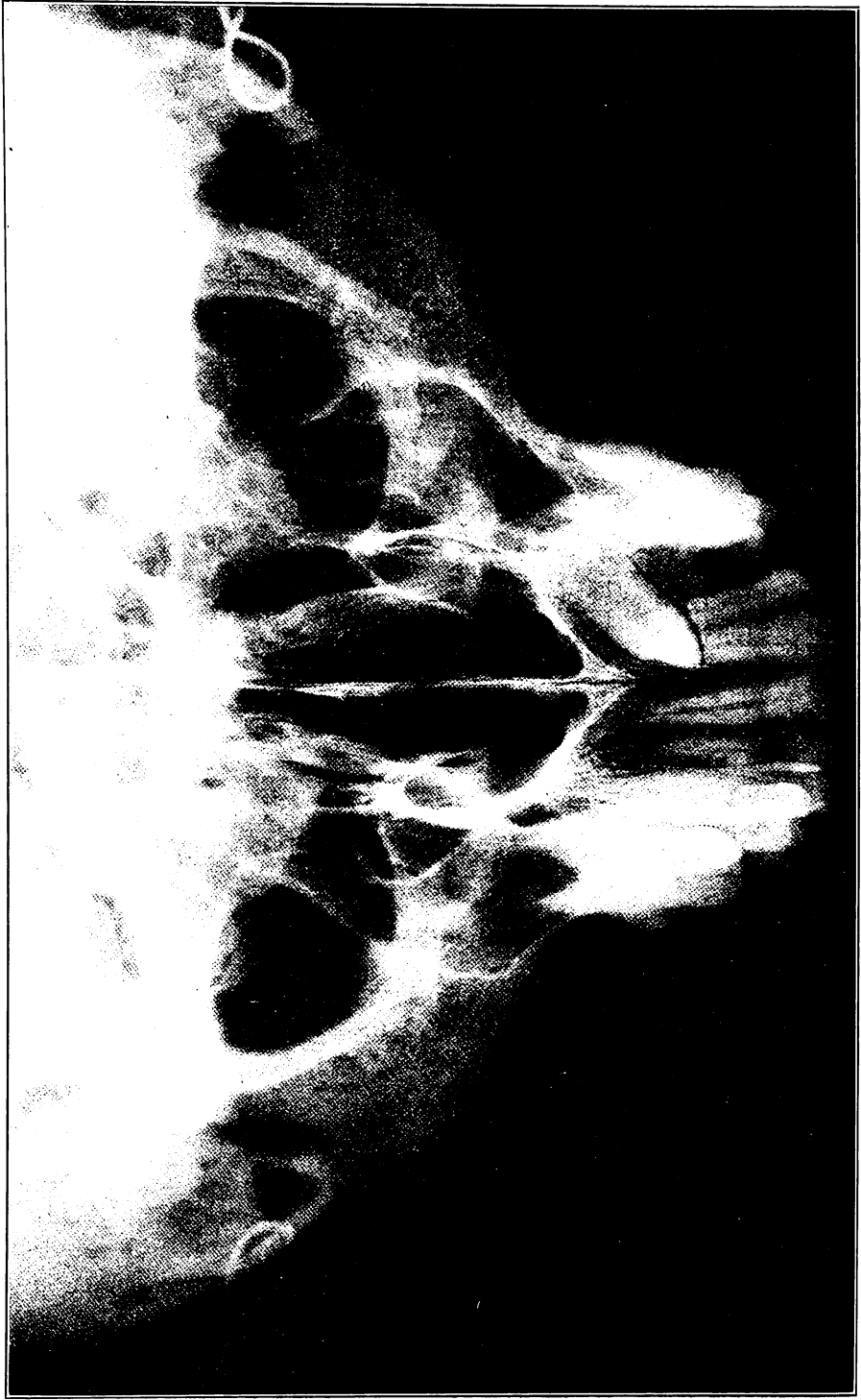


Fig. 133. The same as Fig. 134, except that the half-tone was made directly from the glass negative instead of from a photographic print. This radiograph is of a dry skull. (Radiograph by Cryer.)



Fig. 124. The same as Fig. 123, except that the half-tone plate was made from a photographic print, but reversed for easier comparison. (Radiograph by Cryer.)

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Relative Values of Shadows in Prints.

Densities—deep shadows—we have seen appear as transparencies in the negative. The print, or positive, is the opposite of the negative. Hence, in prints, and half-tones made from them, we see the deep shadows of metal fillings, crowns and posts appearing very dark, gutta-percha, cement, enamel and porcelain a little less dark, and so on. On the print, filled canals appear dark, unfilled ones light, abscesses appear as light areas, and so on, always the opposite of the negative.

In order to avoid confusion of the right and left sides when studying a negative, bear the following in mind: When looking at the negative from its film side it is as though you observed the part radiographed from the position occupied by the tube during the exposure. When looking at the negative with the film side presenting towards the light, away from the eye, it is as though you observed the part from the position of the film during exposure. This is the case, granting that the sensitive side of the film presented toward the object radiographed at the time of exposure, a condition that should always obtain except when an intensifying screen is used.

If the technic previously given is followed, and the sensitive side of the film or plate be placed so as to present toward the part to be radiographed, and then the negative placed in the printing frame with the sensitive side up (this must be done, or there will be a loss of detail) when observing prints, it is as though one looked at the part from the position of the film or plate during exposure.

When looking at radiographs made directly on paper, it is as though you observed the part from the position of the tube during exposure.

Marking Negatives.

How to mark negatives is a subject that has caused the use of a great deal of perfectly good paper and ink. After trying several methods, I no longer attempt to mark my negatives, but place them in envelopes and mark the envelopes as desired. The Lumiere Dry Plate Co. print the following outline on the backs of their envelopes:

No.
Name.....
Address
Date
Case
Tube used
Exposure
Distance of Tube from Plate.....
Developer
Referred by Doctor.....
Remarks

I have lately heard of an "X-Ray ink" for marking negatives, but have been unable to procure any. The desired markings are placed on the envelopes or black paper covering the plate or film, the marking being done on the side of the envelope or black paper presenting toward the sensitive side of the plate or film, so that when the exposure is made the ink markings are between the source of the rays and the sensitive side of the plate or film. This ink must, I think, contain some salt of lead or bismuth, for the X-Rays penetrate it very poorly, and consequently there is a shadow cast on the negative.

My objections to marking small dental films in this manner is that occasionally the shadow of the markings will occur in such a place in the radiograph as to spoil the picture. The older methods of placing wires bent to form the figures or letters for marking, or a stencil of sheet metal, between the source of rays and the plate, is highly unsatisfactory, so far as their application to the marking of small dental radiographs is concerned. After the negative is made, markings may be scratched in the film. But, as I said before, no system of marking the negative itself is as satisfactory as marking the envelope in which it is kept.

One of the most unfortunate limitations of the
Perspective. radiograph is that it lacks perspective. For example, though we are able to observe the exact mesio-distal position of an impacted tooth, we are unable to determine its bucco- or labio-lingual position, with any degree of accuracy.

The closer the object, which is being radiographed, is to the film during exposure, the clearer the resulting shadow will be. Thus, for example, if an impacted cuspid lay lingually to the other teeth, and the film were held inside the mouth as usual, the detail in the picture of the cuspid would be a little greater than the detail in the other teeth. If the cuspid lay to the labial,—farther away from the film,—detail in it would be less than in the other teeth. But, on the whole, this method of determining bucco- or labio-lingual location is unreliable.

While I agree with Dr. C. H. Abbot, of Berlin, who has done some writing and experimental work to prove that radiographs are not totally lacking in perspective, yet I do declare, from the standpoint of their practical application to dentistry, that they are simply shadow pictures. And let me here warn you that like all shadows, X-Ray pictures are often extremely misleading; one might say, for the word seems to fit so well, treacherous. To eliminate the chance of misreading, because of distortion of the radiograph, it is often expedient to make several pictures of the same part or field, changing the pose. Even this, however, does not preclude the possibility of misinterpretation. To correctly read radiographs, a man must be, not only a student of radiography, anatomy, his-

tology and pathology, but he must have and use that gift of the gods—common sense. He must not jump at conclusions, and he should ever regard the radiograph as a shadow picture, liable to all the apparent misrepresentations of shadows.

A study of Figure 125 will convince any one of the lack of perspective in at least some radiographs. One is unable to determine, from observing this radiograph, whether the coin pictured is in the flesh of

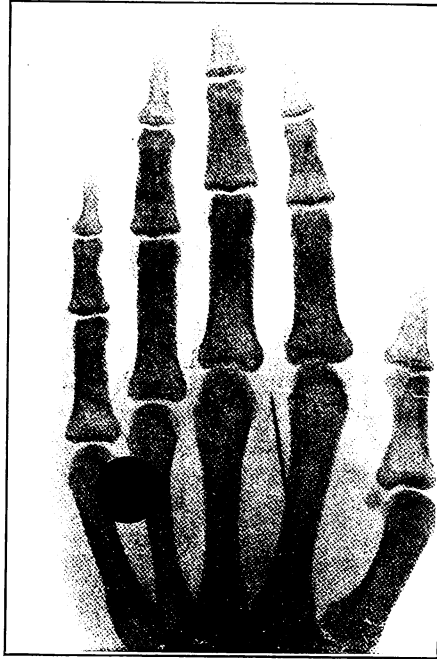


Fig. 125. (Reduced one-half.)

the hand, on the back of the hand, or in the palm of the hand. Likewise, from simple observation, it is impossible to tell whether the needle is in, on, or under the hand. By deduction, we may come to this conclusion: The coin was nearer the plate, during its exposure, than the needle, because the outline of the coin is much clearer than that of the needle, and other things remaining equal, the closer the object being radiographed is to the plate, the clearer its shadow will be. Still we cannot determine the exact location of either needle or coin. We know only that the coin was somewhat closer to the plate, during its exposure, than the needle. That is all.

The coin lay under the hand on the envelope holding the plate, the needle on the back of the hand, when the exposure for Figure 125 was made.

Stereoscope Radiography.

To overcome the fault of the lack of perspective and, to some extent, the distortion in radiographs, one must resort to stereoscopic radiography.

Stereoscope radiography is the science and art of making radiographs, which, when observed through a stereoscope, have perspective. The technic of making stereoscopic radiographs, together

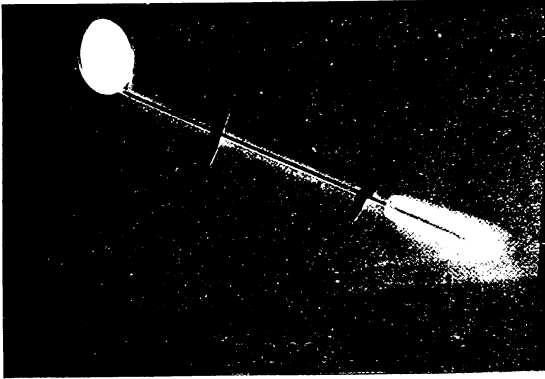


Fig. 126. A Dental Fluoroscope.

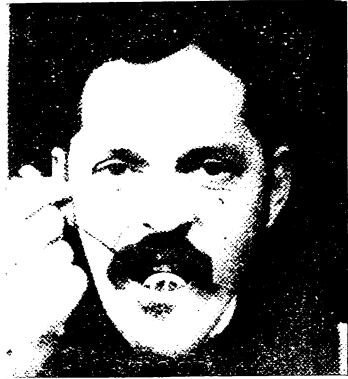


Fig. 127. Shadows of teeth cast on the fluoroscope.

with a discussion of their value and efficiency, will be dealt with at some length in a subsequent chapter.

Dental Fluoroscope.

A work of this kind would be incomplete without some mention of the dental fluoroscope. The simplest and most efficient dental fluoroscope has been designed by Dr. Tousey (Figure 126). Like all fluoroscopes, this one depends on calcium tungstate, or platino-barium cyanide, for its action. A disc of cardboard, coated on both sides with either of the above named chemicals, is placed between two discs of transparent glass, and the glasses and cardboard (or fluorescent screen, for the cardboard becomes a fluorescent screen when it is coated with calcium tungstate or platino-barium cyanide) held together by means of a circular band of metal. A handle now, and we have a dental fluoroscope, the screen protected against moisture, and either side of it may be used.

To use the fluoroscope, the operating room should be dark. It is best that the operator remain in this darkened room for some time until his eyes become accustomed to the darkness before making the exposure.

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Hold the fluoroscope inside of the mouth, and have the tube placed so that the X-Rays will pass through the part to be observed, and strike the fluoroscope. Figure 127 shows the fluoroscope and a shadow of the teeth thrown on it.

The disadvantages of the fluoroscope are:

1. The operator must expose himself to the actions of the X-Rays.
2. Either the time for observation must be made very short, or both operator and patient must be exposed to the rays unnecessarily and dangerously long.
3. The picture on the fluoroscope lacks detail.
4. No record of the case, other than a mental picture, can be kept; while a negative may be referred to as often as expediency or necessity demands.
5. From an educational standpoint, the fact that prints, lantern slides and half-tones can be made from negatives is a great advantage.

To learn to eat olives, one must eat them, so I am told. To learn to read radiographs, one must read them, and so we pass to the next chapter, wherein we shall study, in a practical way, the reading of radiographs.





Some Phases of Dynamics and Anchorage in Orthodontia with Special Reference to Efficiency.*

H. A. PULLEN, D.M.D.

Read before the Central Dental Association of New Jersey, Newark, April 17, 1911.

A short time ago the whole industrial world was startled by the statement of a writer on "Efficiency" in industrial methods that the railroads of this country could save one million dollars a day by the adoption of efficient or scientific management. A storm of protest arose, railroad presidents pricked up their ears, the old method managers declared it was absurd, but the men who were keenly alive to the true science of economical management of industries easily proved the assertions of this writer to be unexaggerated. Because of this statement investigations are now in progress which will eventually lead to the adoption of scientific management by the railroads and other industrial organizations in which the science of efficiency is not yet understood.

Another writer, in an article on scientific management, has also stated that through scientific industrial experiments two fundamental ideas have been developed in the science of efficiency, as applied to the building up of a great industry:

"1. Establishing standards for details throughout the work, and then,

2. Scientific planning of the work."

Now, if it can be proved that in dentistry or in orthodontia our methods lack efficiency, it is certainly within the horizon of the duty of the dentist or orthodontist to examine his record from this standpoint of

*Figs. 14, 15, 18 and 19, by courtesy of Blakiston & Co.



efficiency, and if a reorganization of his efforts is found necessary, the above mentioned fundamental ideas are as applicable to his individual practice as to the building up of a great industry.

In this paper I shall refer to efficiency in regard to methods of correcting malocclusion, especially in relation to the efficient use of applied force, and the scientific selection of anchorage in the use of the expansion arch in producing certain tooth movements, or in developing the dental arches.

Relative to this object, it is easily recognized that the establishment of certain standards for materials and form of construction of appliances, for certain positive and dependable methods of producing force, for proper methods of selecting anchorage resistance and properly proportioning it to the dynamical requirements, are of primary importance in the correction of malocclusion; and it is furthermore easily recognizable that the scientific planning of the treatment of the simplest, as well as the most complex, case of malocclusion should be a fitting complement to such standardization of details.

Therefore, it is to this end that I have chosen for my subject the consideration of certain phases of dynamics and anchorage, with special reference to efficiency, with the idea of calling your attention to such standardizing of details and planning of treatment as should conform to a proper standard of efficiency in orthodontic practice.

Efficiency is defined as "the ratio of useful work to the energy expended," and, as applied to orthodontic operations, means the same thing that it does in mechanics or the industrial arts.

As applied to mechanics, it has been aptly stated by one writer on the conservation of energy in machines that, "If a machine could be made that wasted no energy, the resistance being all useful and not wasteful, the machine would be perfect and its efficiency would be unity."

Inasmuch, however, as all machines waste energy through friction, multiplicity of working parts, etc., the efficiency of any machine can be stated in a proper fraction or a percentage of the work put into machine.

Whatever is true regarding the loss of energy in machines through friction, multiplicity of working parts, etc., applies with equal, if not greater, force to the machines or appliances used upon the teeth for the correction of malocclusion, more especially because of the relative instability of these appliances in the mouth, as compared with similar appliances upon a fixed base outside the mouth.

There are many reasons why appliances in the mouth should lose energy or force, and thereby become more or less inefficient, but two reasons are of sufficient importance to make them of especial note.

1st, the imperfect control of forces used upon the teeth.

ORTHODONTIA

2nd, the lack of sufficiently stable anchorage for the resistance of these forces when applied.

Examples of Inefficiency.

A few illustrations of conditions wherein there is imperfect control of energy, either of force or resistance, might be recorded in the following observations from practice:

A patient comes in with a removable appliance, not in his mouth but in his pocket, or maybe he has left it in a convenient haystack in which he has been turning somersaults; or, it may be the operator has adjusted a complicated fixed appliance, with a jackscrew supplied for every tooth movement, and he has apparently come to the end of his rope with failure staring him in the face, because there is not room enough in the mouth for another jackscrew, and the necessary tooth movements cannot be carried out without it; again, the operator is in favor of fixed appliances, but his adaptation of ready-made clamp bands, without realigning the buccal tubes, has caused the expansion arch to drop to the edges of the incisors, and his limited experience is face to face with the problem of inefficiency; or again, a patient will present wearing expansion arches, but, upon close examination, it will be seen that, although the expansion arches are in position, nothing has been accomplished since the last sitting, owing to the slipping off of the ligatures, due to the unturning of loose nuts on the expansion arches in front of the buccal tubes, and the play of the expansion arch in loosely fitting buccal tubes; again, an uncemented clamp band has taken a notion that it prefers the root of a molar to its crown, and has slipped skyward and caused severe inflammation and denudation of the periodental membrane; still another case may appear with the molar anchor teeth so badly tipped that the appliance will have to be removed and the case rested; in another case a base metal anchor band has corroded through and broken, necessitating renewal; or a base metal expansion arch, to which a spur has been hard soldered, has lost its expansive force and the case is not progressing.

This loss of energy or lack of efficiency in orthodontic appliances is a serious matter when it means failure to obtain successful results, the consuming of an inordinate amount of time in operations, or the production of unnecessary discomfort.

Fundamental Principles of Force and Resistance.

It is evident, then, that it is necessary to understand the elemental factors of force and resistance, which are involved in the use of an appliance for the correction of malocclusion before the contemplation of treatment of even the simplest case.

In the consideration of these forces, it will be noticed that applied force is active, and, to a degree, directly opposed to the other factor,

resistance, which is passive, or latent energy, incapable of being measured, except by the corresponding degree of active energy, or force necessary to overcome it.

In orthodontic operations, the force is represented in the power of the appliance, the expansion arch, for example, and the resistance is represented as of two kinds, one at the base of anchorage, as in the molar region, the other at the point of delivery of the force, as in the incisor region, although there may be a number of points of delivery of the force.

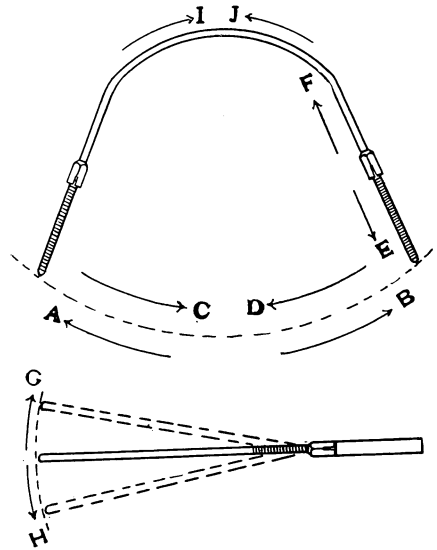


Fig. 1.

But in actual practice, it often happens that the force is delivered in such a manner that the molar anchorage is intentionally made unstable, for the purpose of expanding in the molar region, the molar tooth being at the same time both an anchorage and a point of delivery of applied force.

It is evident, then, that these two basic factors, force and resistance, are somewhat inseparable in their consideration, and a proper utilization of both must at all times be correctly proportioned in respect to their requirements in a given case.

Resistance, although latent, is nevertheless energy, and should always be accurately selected and proportioned to the dynamical requirements of the necessary tooth movements.

Conversely, the force should be proportioned to the resistance selected as anchorage, so that at all times, if possible, the resistance at the point of delivery of the force shall be less than that at the base of anchorage, so as not to cause the anchor teeth to become unstable and unfit for further use as anchorage.

However inseparable force and resistance may appear in treatment, it is necessary for a proper understanding of each to study them sep-

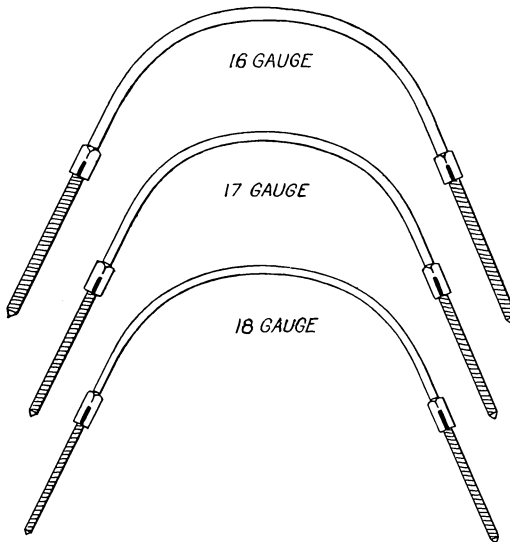


Fig. 2.

arately in order that we may know the capabilities of each, and especially how each may be best conserved and thereby made most efficient.

We shall examine them with special reference to the expansion arch and its anchorage, taking up first the dynamical possibilities of the expansion arch and the manner of conservation of some of the various forces at its command.

Expansion Arch.

The expansion arch is capable of exerting force in six well defined directions in the horizontal plane, as indicated by the arrows A, B, C, D, E, F, I and J, in the chart, Figure 1. Some of these forces are much greater than others, as, for example, the force of the screw being greater than that of the lateral spring, but these forces are so nicely balanced in the expansion arch that by its use all of the various tooth movements in the horizontal plane are easily accomplished. Being formed in

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the shape of an arc of a circle, the expansion arch is also capable of exerting the force of a spring at any point upon its outward circumference.

These lines of force radiate outward, as it were, from the arc of this circle, so that the number of lines of force possible to conceive is almost indeterminate. Lines of force operating inwardly toward the teeth are less in number, although existing when the expansion arch is used for contraction of the dental arch, or in retruding the anterior teeth. Again, force is produced by the expansion arch in the vertical plane, as indicated in the lower diagram of Figure 1, by the direction of the arrows G and H.

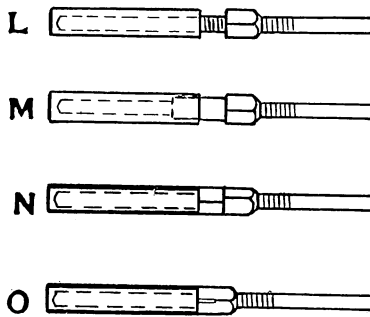


Fig. 3.

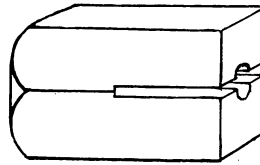


Fig. 4.

Strange as it may seem, nearly all of these various forces may be in use at the same time in such combination of operations as lateral expansion, forward movement of anterior teeth, backward movement of molars, elevations of bicuspid, depression of incisors, *et al.*

In order to proportion the force in the arch to the work required of it in the mouths of persons of varying ages, the expansion arch is made in several sizes, grading downward from a diameter of 16 gauge to 18 and even 19 and 20 gauge (B. & S.), Figure 2, and is also made in varying lengths to fit different lengths of dental arches. The 16 gauge arch seems to be too rigid or inelastic for use in the mouths of children, and arches of smaller diameter than 16 gauge are often used in adult mouths. These arches are of various sizes in order to be more efficient in use, not simply to be less conspicuous in the mouth.

Expansion Arch Nuts.

To further serve the purpose of efficiency the threads of the arch should not be too deep nor extend too far forward on the arch itself, as these are elements of weakness; also, when the expansion

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arch is in position in the buccal tubes, there is an element of weakness, or a point where force may be rapidly lost, where the nut engages the end of the buccal tube, provided that the details of construction of the nut and buccal tube are incorrect. The object of the nut is to exert pressure against the end of the buccal tube and transmit the force to or from some of the anterior teeth.

If this object is defeated by a nut which unturns during mastication, the force is, of course, inactive as soon as the nut unturns, and the treatment does not progress. In a similar manner force is lost and indirectly applied when the expansion arch is supported by a loose-fitting buccal tube, which allows upward and downward play of the arch. Cases have been delayed for many months and have failed to be successfully treated on account of a loose-fitting tube and a loose nut.



Fig. 5.

The drawing L in Figure 3 shows a loose-fitting buccal tube in conjunction with a plain nut on the expansion arch, a combination which is always inefficient, because of the nut being easily unturned during mastication, and because of the excessive play of the arch in the buccal tube. The friction sleeve nut and loose-fitting buccal tube shown at M, is a long step in advance, since the nut is prevented from unturning by the friction of a tight-fitting sleeve on the buccal tube. There need not necessarily be any play of the expansion arch in the buccal tube when this style of nut is used, but there is in many of the tubes furnished with the friction sleeve, and this play eventually enlarges the friction sleeve so that the nut easily unturns, and the applied force is rendered inactive. The play of the arch in the buccal tubes also tends to loosen ligatures and to lessen the power and change the direction of the force at the point of delivery. The mechanically perfect form of the friction sleeve combination would be embodied in the additional use of the close-fitting buccal tube.

The drawing N illustrates a close-fitting buccal tube supporting the expansion arch, and the double locking nuts engaging the end of the buccal tube. This combination is also very satisfactory, and could be recommended if there were not something better. The close-fitting buccal tube eliminates all play of the arch in the tubes, and the use of the double

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nuts tightened against each other eliminates all possibilities of loss of force at points of delivery.

However, the writer believes that he has devised a still better combination, in that it is simpler and takes a shorter time to adjust—the close-fitting buccal tube and split nut shown in the drawing O. The split portion of the nut is pinched together before the nut is run on the expansion arch, so that it exerts a continual strong spring pressure upon the threads of the arch when in position, thus preventing any unturning except when the wrench is used. An enlarged drawing of the split nut is shown in Figure 4, illustrating this principle to better advantage.

With this combination, the arch is steadily supported by the close-fitting buccal tube, doing away with all upward and downward play of the arch, and the firmly set split nut keeps up the force exerted against the end of the buccal tube until the resistance anterior to the nut is overcome. In other words, the principle of efficiency has been carried out to as near perfection as is possible at this usually inefficient point.

For a number of years the writer has been working on a simple, and yet efficient, method of tightly holding the expansion arch in position in the buccal tube, and having solved the problem to his own satisfaction, takes this opportunity of presenting the result of his investigations. (Figure 5.)

Method of Holding Arches Tight in Tubes.

A curved spring is ground on the ends of the expansion arch with the small carborundum wheel, taking care to first grind off the threads. This curved spring can then be bent upward to exert any desired degree of force against the inside of the buccal tube from the slightest spring force, just sufficient to hold gently the arch from slipping, to a force so strong that it is impossible to remove the arch from the buccal tubes with the fingers alone.

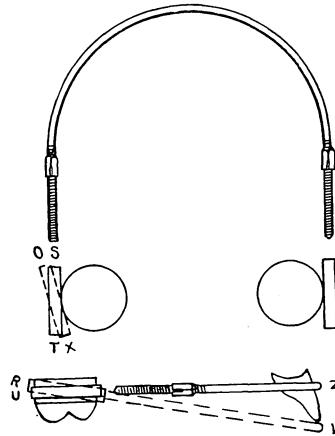
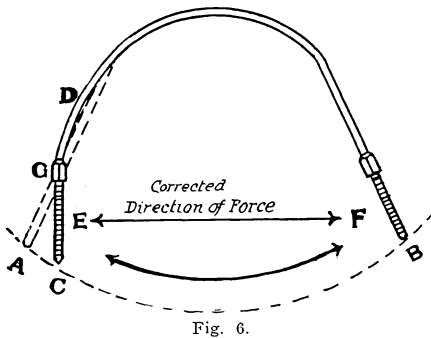
Experiments were made, such as the use of finger springs on the buccal tube extending over the nut on the expansion arch; cutting a spring in the buccal tube to press against the arch; splitting the ends of the arch and forming a double spring; exerting force against the inside of the buccal tube, and other methods, all of which were more complicated, or were less perfect in their action.

It is of more than passing significance that in the working out of the principle of the self-locking nut, and the self-locking arch, so to speak, the secret of the hidden force, most applicable from the standpoint of simplicity and efficiency, lay respectively in the nut and in the arch wire.

That the principle of the self-locking arch is of unusual value, the writer has no hesitancy in declaring, since the real need of it has existed for a long time.

Spring Force in Expansion Arch.

In further study of the dynamics of the expansion arch, with especial reference to the control of the direction of the force exerted in expansion, we shall find still further means of increasing the efficiency of the expansion arch. For example, in Figure 6, the arc A B describes the path of the force exerted by the expansion arch as it would be if the arch were used in the shape as it comes from the manufacturers. Applied in this form, there is the extreme of



expansion in the molar region, while in the region of the cuspid and first bicuspid, the amount of expansion is almost zero. Also, the molar anchor tooth, following the path of this curve, must be rotated outward from its distal angle.

It is evident, then, that the force is incorrectly applied in this manner, and renders the work inefficient. To correct the direction of the force so as to expand in the bicuspid region, the arch must be bent in a broader anterior curve as at D, Figure 6, and, to correct the direction of force upon the molar tooth, the ends of the arch must be rather sharply bent inward in front of the nut G, so that the force will be directed more nearly along the parallel lines, as indicated by the arrow E F. Again, by this correction of deficient original form we have gained in efficiency in operation of the expansion arch.

Influence of Buccal Tubes.

For the same reason that it is necessary to change the shape of the expansion arch to obtain proper control of the direction of the forces of expansion, it is also necessary to correct the position,

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or to establish proper alignment of the buccal tubes in the horizontal and vertical planes. If the buccal tube should chance, as it usually does in the ready-made clamp band, to be in a position illustrated by the dotted lines O X in Figure 7, a realignment of the tube to the position S T is necessary, to enable the arch to slide into the tube without misdirecting the force upon the molar anchorage.

In the vertical plane as well, it is necessary to realign buccal tubes from such position as is shown by the arch P V to the position U Z, in which the arch is in proper relation to the labial surfaces of the incisors,

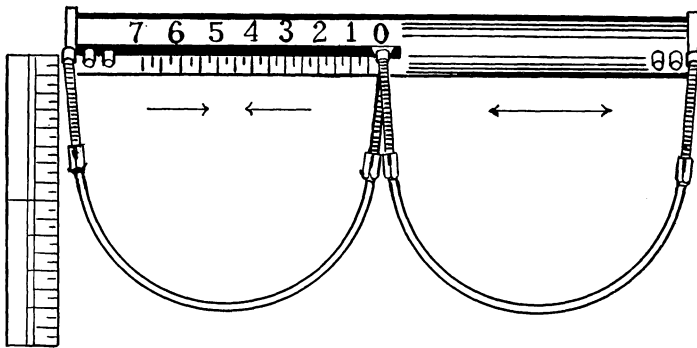


Fig. 8.

in order to properly direct the force, and thereby bring the appliance up to the proper standard of efficiency.

Proper alignment of expansion arches and buccal tubes having been secured, the next step is to exert an expansive force, as may be required for the individual case. A certain degree of lateral expansive force may be desired, and this force must be obtained by proper bending and adjusting of the arch to meet the conditions present.

In the drawing, Figure 8 is represented a method of determining by means of a spring balance the degree of expansive force exerted by the arch. The expansion arch on the right is slipped into short tubes soldered respectively to the end of the balance and to the indicator point. If the 0 mark registers the passive position of the expansion arch in the buccal tubes when no expansion is desired, the figures 1, 2, 3, etc., will register any degree of expansive force put into the arch by bending, so that the degree of expansive force may be expressed somewhat accurately, as follows:

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0—Passive.

$\frac{1}{8}$ lb.—Slight expansive force.

$\frac{1}{4}$ lb.—Medium expansive force.

$\frac{1}{2}$ lb.—Strong expansive force.

From $\frac{3}{4}$ of a pound, and points beyond, would be represented extreme potential, which can be recorded; as, for example, it might be recorded that an arch was placed in position with an expansive force of $1\frac{1}{4}$ pounds, etc.

The expansion arch slipped into tubes on the left side of the spring balance would register the amount of force it might be desired to exert lingually, indicated by the same numerals.

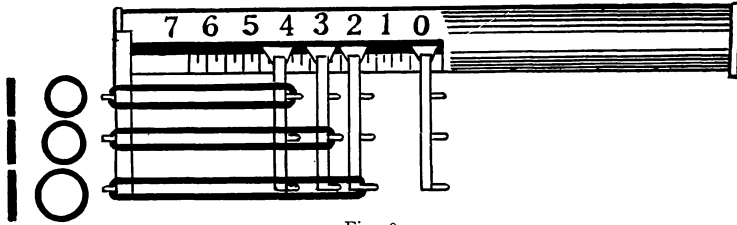


Fig. 9.

It must not be forgotten, however, that two arches of the same gauge may be longer and shorter to fit the case, and the shorter arch will register a proportionately greater force with its two ends separated the same distance as the longer arch, because a shorter spring exerts a greater force than a longer spring, the gauge of the wire and the material of construction being the same in each case.

Hence, the necessity of measuring the length of an arch as by the scale on the left before registering its force. Both items should be made a matter of record, so that somewhat accurate knowledge of the power of the forces used may be known. This idea of the spring balance was first suggested by Dr. Hawley for determining the comparative elasticity of precious metal expansion arches and base metal arches.

Just at this point, when we are considering the measurement of the force of the expansion arch as tending towards efficiency, it may be well to speak of certain advantages in efficiency to be gained through the measurement of the amount of force exerted by the intermaxillary rubbers. I believe if the various rubber rings used by orthodontists in this country could be compared it would be found that the size of these rings would vary from election bands to rubber bands of perhaps $\frac{1}{2}$ or $\frac{3}{4}$ inch

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in diameter. As to the quality of the rubber, the elasticity would also vary according to its newness and degree of vulcanization.

What is needed, then, is a variety of sizes of fresh rubber rings, cut from pure Para gum tubing, the sizes varying according to the needs of the case. What are known as election bands and their larger sizes, found in the stationers' stores, are not pure Para gum, and their elasticity is soon lost in the fluids of the mouth.

Pure gum tubing in sizes varying from one-sixteenth to five-sixteenths of an inch internal diameter can be found at the rubber supply stores, and usually in freshly vulcanized lots.

Now, as to the measurement of the force exerted by these various sizes of rubber rings, we will take, for example, the size in most common use, cut from pure gum tubing, that with an internal diameter of $\frac{1}{4}$ inch, and put it on a stretch on the same scale used for the expansion arch, as shown in Figure 9, using a fixed distance of $1\frac{1}{2}$ inches, which is an average distance from a hook on the arch opposite the upper cuspid to the end of the buccal tube on the lower first molar, and we will find that it registers $\frac{3}{4}$ of a pound. Here we have at last something definite. Cut the ring a little wider and it will register one pound of force exerted.

The next size, five-sixteenth inch rubber rings, can be cut to exert exactly the same force on a stretch of $1\frac{1}{2}$ inches, and there will be a greater amount of comfort in wearing the larger size ring on account of the limitation as to the length of stretching being greater than in the $\frac{1}{4}$ -inch tubing. In my practice, these rings are all measured on this scale and placed in envelopes marked with the diameter of the ring and the number of pounds force exerted, as the case may be. Of course, this rubber does not deteriorate on my hands, because I keep a limited supply, and get new tubing every few weeks.

There may be nothing new in this to some of the orthodontists who have been studying this same subject, but at least the method in its accuracy, both as to sizes of rings and the amount of force each size exerts, is an advantage gained in establishing efficiency.

Studies of Resistance.

Having shown how the force of the expansion arch could be controlled, directed and conserved, and the manner of resisting the force exerted by the arch and the intermaxillary elastics, thereby making these forces most efficient for the work to be performed, there is next to be considered the other factor, resistance, having to do especially with the base of anchorage and the points of delivery of the exerted forces in regard to preserving the highest standard of efficiency through such means as are possible when the expansion arch is used.

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If a given force requires a given resistance as a base from which to operate, the forces of different intensities will require resistance bases of such degrees of latent potential as will be correspondingly greater than these respective forces.

Again, if a force requires a greater resistance at the base in order to overcome an increased resistance at the point of delivery of the force, there should be provided means whereby such basal resistance may be increased in order that in the application of force to the teeth, resistance may be always proportioned to the power of the force in greater degree. These qualities in the form of resistance are included in what is known in orthodontia as anchorage, whereby, for example, a tooth of larger size, or more favorable location, is chosen as anchorage in resisting a force which is to move a tooth of lesser size and less favorable location for resistance of this force. The first step in seeking proper anchorage is, therefore, comparing the resistance that is at one's command with the amount of resistance of the force to be expended, and with the resistance of the teeth that are to be moved by this force.

Thus it will be seen that what is known as anchorage is a study of comparative resistance values in the teeth and dental arches, and may be simply defined as "*The resistance selected as a base from which force is to be delivered for the movement of teeth.*"

Choice of Anchorage.

Let it be emphasized, then, that anchorage is a selected, not a haphazard, resistance, and in making this selection of resistance for anchorage there must be taken into account the relative thickness of the alveolar process as governed by the age of the patient, the lesser resistance to mesial than to distal movement of teeth, and the relative stability of individual teeth, as measured by their location, size, and number, and the length of their roots.

The use of the first permanent molars as anchor teeth is an example of selected resistance, since the size of their crowns, the number of their roots, and the density of the alveolar process surrounding their roots insures sufficient resistance for many orthodontic operations.

Inasmuch as you are doubtless all familiar with the various forms of simple stationary, re-enforced, reciprocal, and intermaxillary anchorage, we will pass their consideration to discuss some features of efficiency in the construction of the buccal tube.

Influence of Buccal Tubes in Anchorage.

Taking up, then, an element in the efficiency of construction of the anchorage for the expansion arch, the relative value of the various kinds of buccal tubes in increasing the resistance of the molar anchorage, it will be evident that in the usual form the

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round tube E, Figure 10, the pivotal action of the arch in the tube has a tendency to tip the anchor tooth. To overcome this tendency, where it is necessary, the square buccal tube and square ended expansion arch, shown at F, may be used to advantage, as suggested by Dr. F. C. Kemple.

A simpler method, suggested by Dr. Hawley, consisting of slitting the round buccal tube as in G, and soldering a lug on the expansion arch to engage with this slit, answers the same purpose as the square buccal tube. A still simpler method, suggested by Dr. Lourie, consists in slightly

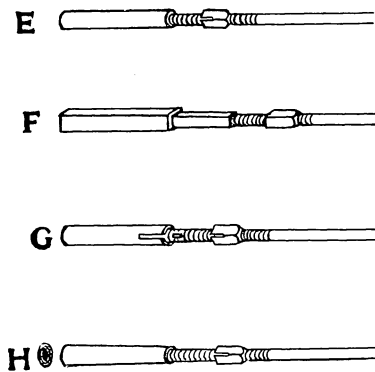


Fig. 10.

flattening the distal ends of a round buccal tube as at H, and filing the end of the expansion arch flat to fit the flattened portion of the tube. The elliptical tube can also be used, and the expansion arch filed to fit it, thus securing the same effect.

With any of these methods the same purpose is achieved, that of increasing the resistance to lateral movements of the molar anchorage, so that to move at all the molar must move bodily through the process. The specific use of these methods will be shown in one of the practical cases to be illustrated a little farther on.

It is obvious that a stable anchorage must have a greater resistance than the point of delivery of the force, as illustrated by the first diagram A in Figure 11, in which the anchorage resistance R, is 4, the

force F, 2, and the resistance at the point of delivery R, is 1. This diagram might also represent a simple anchorage, according to the definition, except that we would scarcely expect even slight tipping of the anchor tooth where the anterior resistance is so small.

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An unstable anchorage might be represented by the diagram B, in which the anchorage resistance is R_4 , the force F_6 , and the resistance at the point of delivery, R_4 . Here the resistance of the force at the anchorage and the point of delivery is the same, and the force F_6 is greater, hence the anchor tooth would be as likely to move as the anterior teeth. Now this condition of affairs is found in many practical cases, and yet if the minimum resistance in the anterior teeth is pitted against the maximum resistance in the molar anchorage by ligating one or two in-

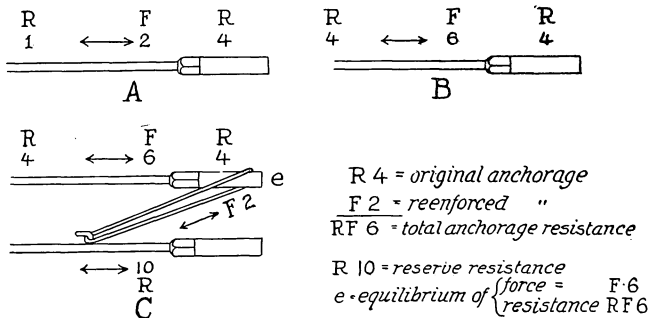


Fig. 11.

cisors at a time to the expansion arch, a simple anchorage, where only slight tipping of the anchor teeth occurs, may be maintained without reinforcement.

Anchorage Re-enforced with Elastics.

**Anchorage
Re-enforced with
Elastics.**

There are many cases, however, in which a simple anchorage would fail to produce results, and thereby become inefficient unless the simple anchorage were re-enforced. One of the best ways of re-enforcing the molar anchorage is by means of intermaxillary anchorage, as shown in diagram C in Figure 11. The resistance $\frac{1}{2}$ at the point of delivery of the force being the same as the resistance $\frac{1}{2}$ at the anchorage, a re-enforcement of an intermaxillary force in the opposite direction of approximately $\frac{1}{2}$, from the buccal tube on the upper molar to a hook on a lower expansion arch, will increase the resistance of the upper molar anchorage to such an extent that it will be at least stable. This intermaxillary force does not disturb the stability of the anchorage in the lower arch, since the force is directed distally, thus securing the resistance of all of the anterior lower teeth, incisors, cuspids and bicusps, as well as the molars.

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In order to illustrate a malocclusion in which re-enforcement of the anchorage in this manner is not only desirable, but necessary for correct treatment from the standpoint of efficiency, a case of Class I (Angle), of what is known as an apparent protrusion of the lower dental arch simulating Class III deformities, is shown in Figure 12, in the before and after treatment models, and in the following figure the arrangement of the appliances.

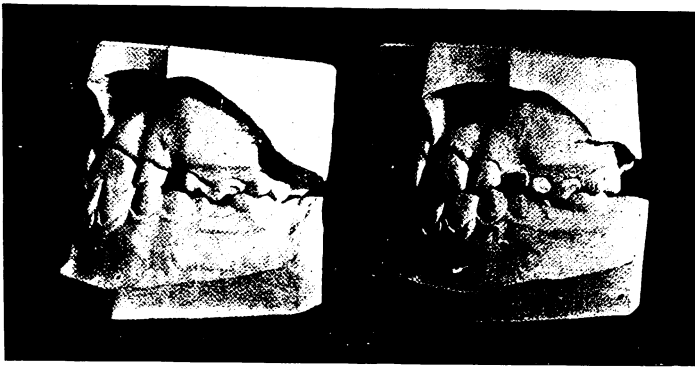


Fig. 12.

If cases of this character are treated as ordinary Class I cases, and an attempt is made to move the upper incisors from lingual to normal occlusion, using the upper first molars as the sole base of anchorage, success is not always assured. It often happens in these cases that the first molars tip distally to such an extent as to render them unfit for anchorage. This is easily understood when the resistance of the upper incisors to labial movement is antagonized by the enormous resistance of all the lower anterior teeth as well.

In the writer's experience these cases have been most successfully treated by the intermaxillary anchorage as a re-enforcement of the upper first molar anchorage, as shown in Figure 13. This is the same arrangement of appliances as used in the treatment of Class III, except that the strength of the intermaxillary elastic is gauged so that it is not so great as to produce mesial movement of the upper first molars, but rather to just balance the distal force of the upper expansion arch, establishing an equilibrium in the upper first molars of the distal force of the arch, and the mesial force of the elastic.

To further illustrate from practice a case of malocclusion exhibiting such abnormal relations of the occlusion as would require the same re-

enforcement of a first molar anchorage as exhibited in the drawing in Figure 13, for the purpose of securing the highest efficiency in the appliance, another Class I malocclusion with the upper right cuspid in lingual occlusion is shown in Figure 14 and 15. The dynamical requirements and the needs of anchorage resistance in a case of this kind are scarcely appreciated from a glance at the model in occlusion, these models being shown first to exhibit the results obtained.

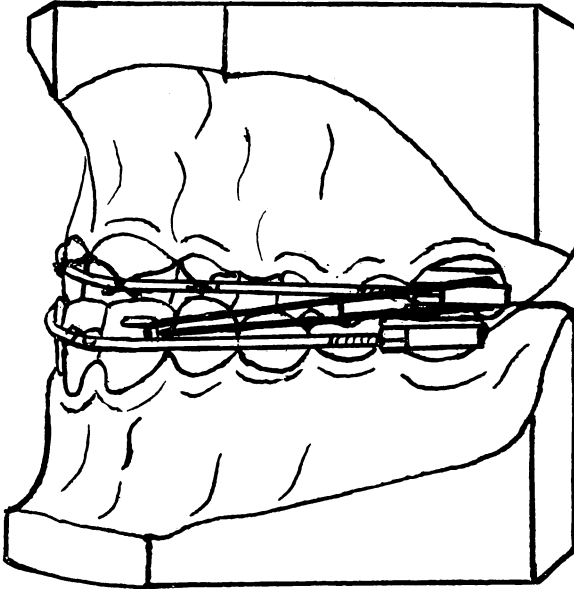


Fig. 13.

The next illustration (Figure 16), however, shows at a glance the obstacles to successful treatment of the case. It will be seen from the drawing that the space for the right cuspid is being opened between E and D, and the force exerted to do this is directed distally against the right upper first molar. The right cuspid is being moved forward opposite its space by means of a traction screw, B C, the force of which is exerted not only in the direction of the moving cuspid, but also distally against the same first molar. Obviously, the distal action of these two forces is too great for the first molar anchorage to withstand without re-enforcement.

In consequence, it is necessary to provide for the re-enforcement of the upper first molar anchorage by using the resistance of the lower dental arch through intermaxillary anchorage, as shown in Figure 17.

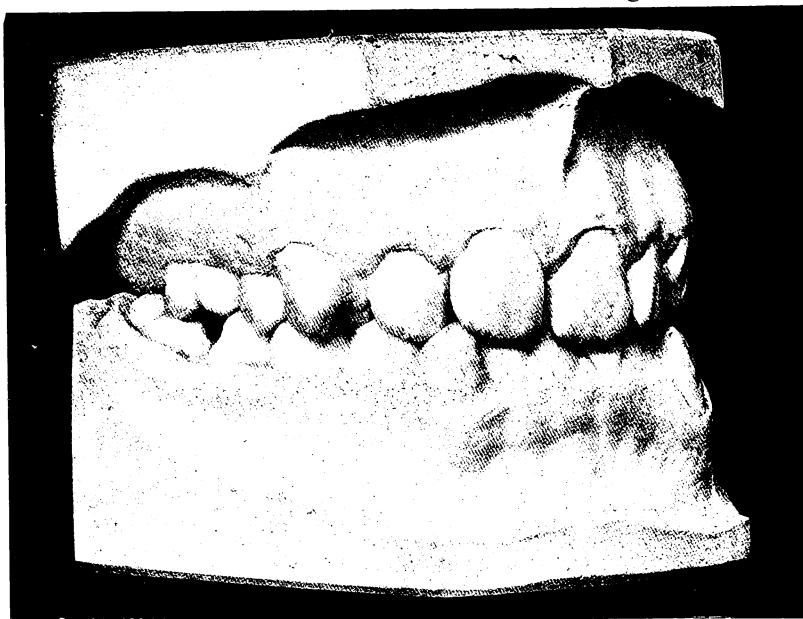


Fig. 14.

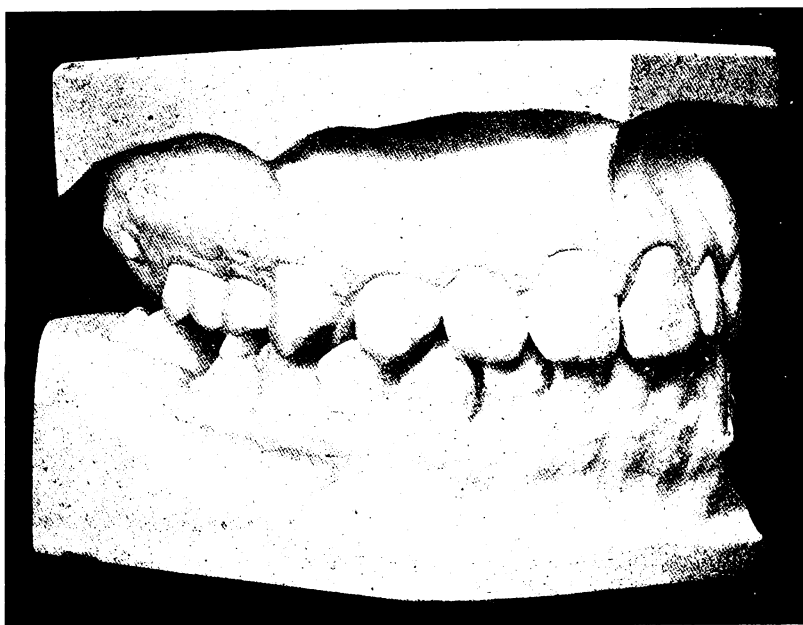


Fig. 15.

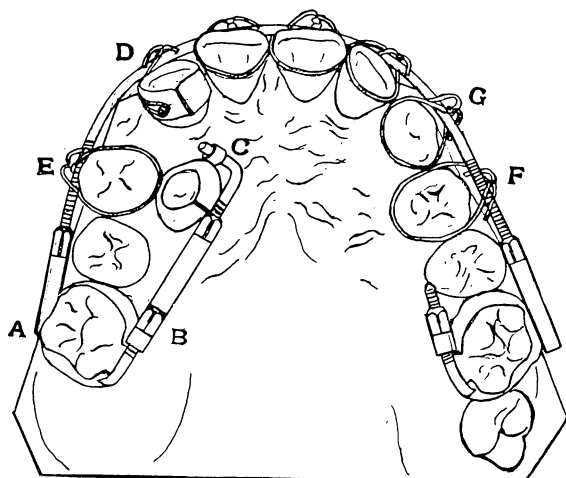


Fig. 16.

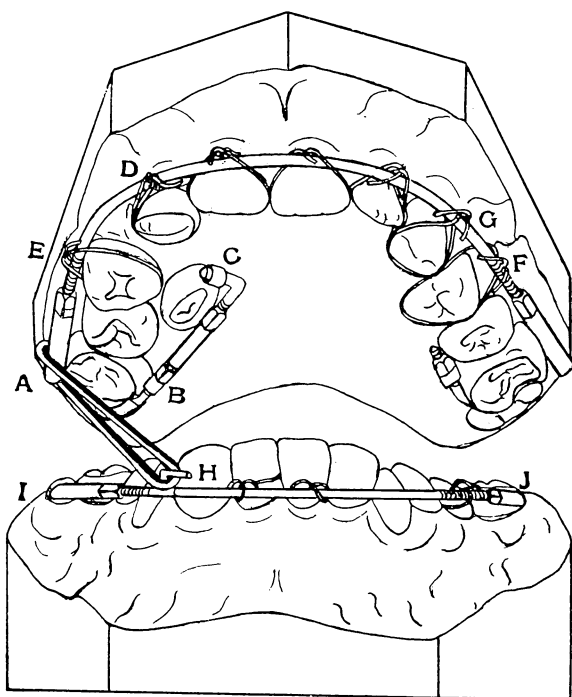


Fig. 17.

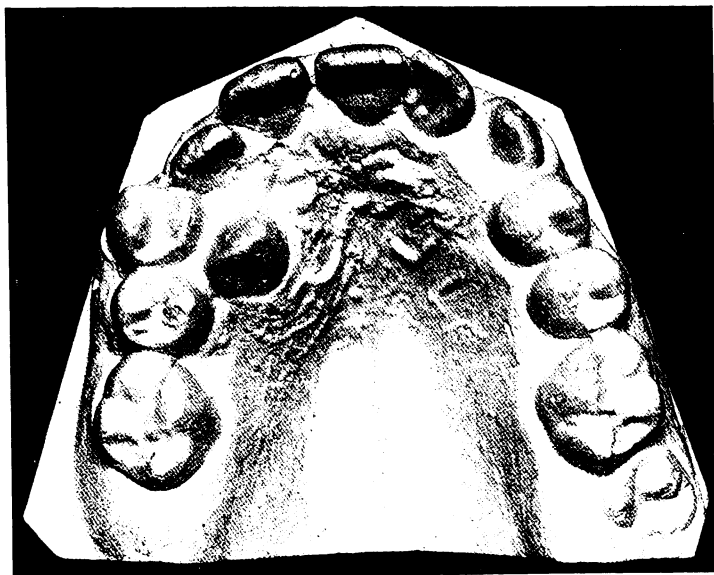


Fig. 18.

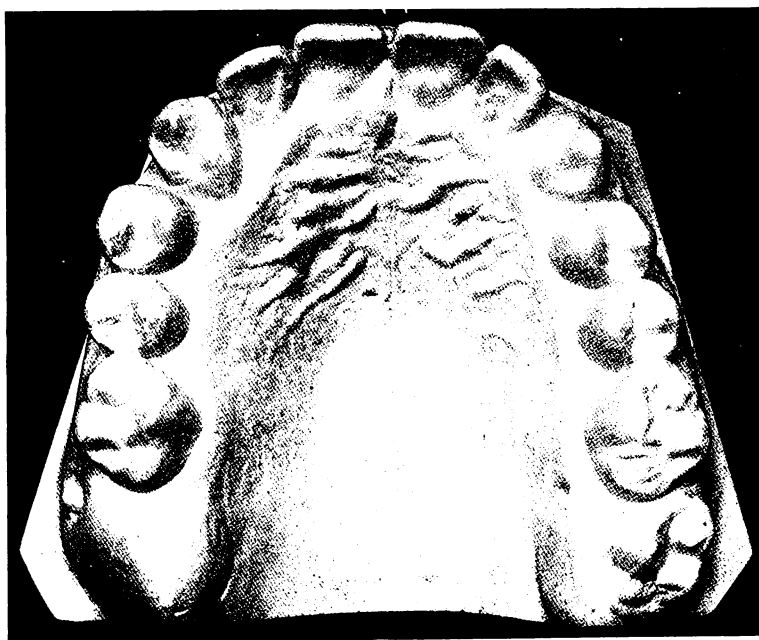


Fig. 19.



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Here, again, the resistance of the first molar to distal movement from the force of the expansion arch is offset or counter-balanced by the mesial action upon it of the intermaxillary force, establishing an equilibrium of antagonizing force. To bring these factors into play, and to predetermine the necessity for their action and such re-enforcement of anchorage, requires the highest skill of the orthodontist's art, which has brought the expansion arch and its accessory appliances up to the present high standard of efficiency.

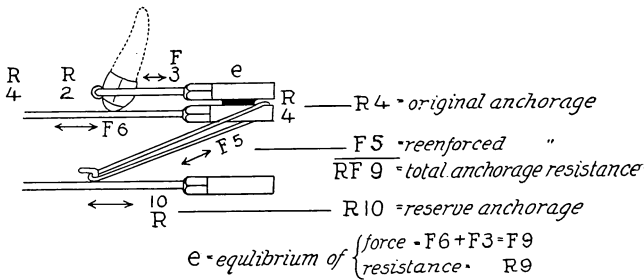


Fig. 20.

The result of treatment in this case, while primarily to establish normal occlusion, required that the cuspid be restored to its normal position in the upper arch without disarrangement of a normal occlusion, and could only be brought about by the treatment as outlined. The occlusal views in Figures 18 and 19 of the upper casts, before and after treatment, show the cuspid restored to its position in the arch, and the shape of the arch also restored through development during a rather long period of treatment.

Another example of efficiency in the use of the expansion arch combined with the traction screw, shown diagrammatically, is illustrated in Figure 20, in which a traction screw is operating from the molar anchorage at the same time that the expansion arch is moving teeth anteriorly in the upper arch. Without re-enforcement the upper molar anchorage would be entirely inadequate to resist the force exerted against it.

The original anchorage resistance is represented by R_4 , the resistance at the point of delivery of the force is R_4 , and the resistance of the cuspid to the traction screw is R_2 . The resistance at the base of

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anchorage being less by 2 than the resistance to be overcome at the point of delivery, it is necessary to re-enforce the original anchorage resistance by intermaxillary anchorage. Adding an approximate intermaxillary force of $F\ 5$ to the original anchorage $R\ 4$, totals an anchorage resistance of $R\ F\ 9$, which exactly balances the exerted force $F\ 9$, constituting reciprocal anchorage.

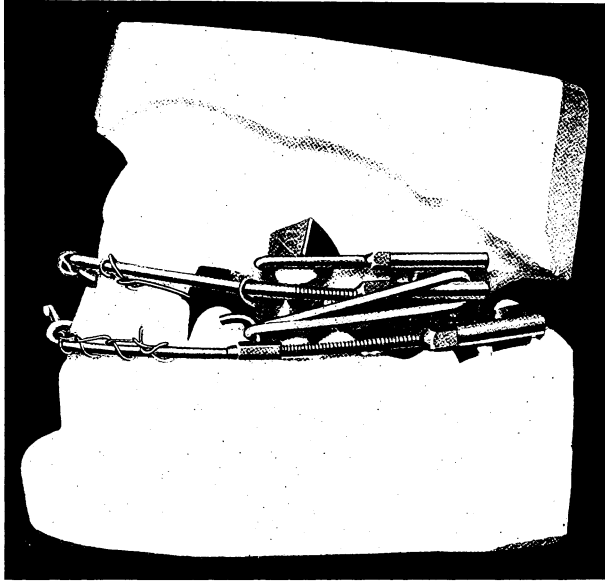


Fig. 21.

In case the resistance at the point of delivery should be increased, any of the reserve resistance $R\ 10$ in the lower arch may be added to the original anchorage $R\ 4$ by applying a proportionately greater intermaxillary force.

A practical case of Class I, requiring just such a combination of force and anchorage resistance, is shown in Figure 21, the appliance being in position. The addition of intermaxillary anchorage in this case is the only possible means of re-enforcement of the upper molar anchorage, so that the case could be carried through to a successful result. It will be noted that the upper incisors are in lingual occlusion, making the resistance to anterior movement very great, and necessitating the use of two intermaxillary elastics of $\frac{1}{4}$ inch French tubing of $\frac{3}{4}$ -lb. force each to sufficiently re-enforce the upper molar anchorage.

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The occlusal view of the appliance in position is shown in Figure 22. The hooks on the lingual surfaces of the bicuspid and molar bands were for the purpose of attaching an elastic rubber to further re-enforce the molar anchorage. Such combinations of appliances are for the purpose

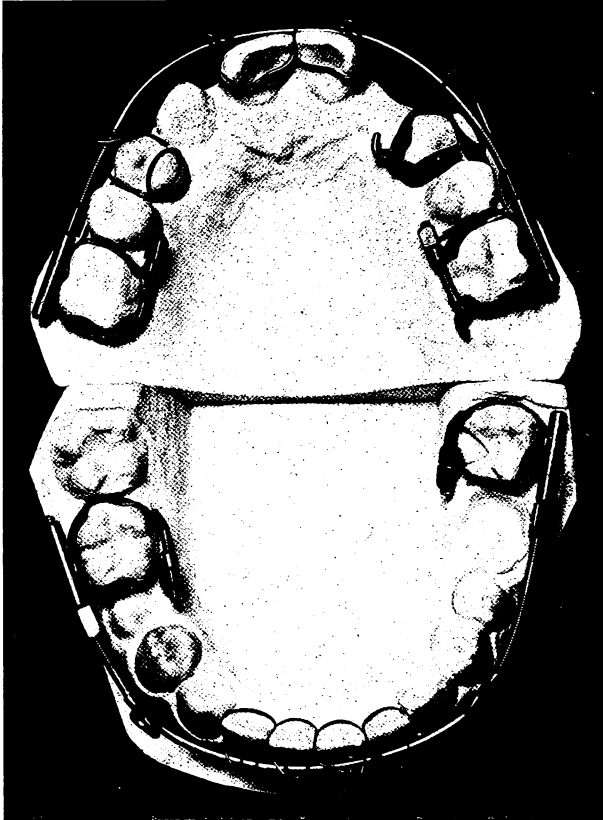


Fig. 22.

of securing the highest standard of efficiency, without which it would be impossible to successfully treat such a difficult case as this.

The results of treatment of this case are shown in Figures 23 (before), and 24 (after). The upper lateral incisors never erupted, so that it was necessary to supply artificial substitutes attached to backings, which were soldered to Carmichael attachments to the lingual surface of the upper cuspids.

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The change in shape of the upper arch, as shown in Figures 25 and 26, is also unusually interesting by comparison of the upper casts before and after treatment.

Fig. 23.

Fig. 24.

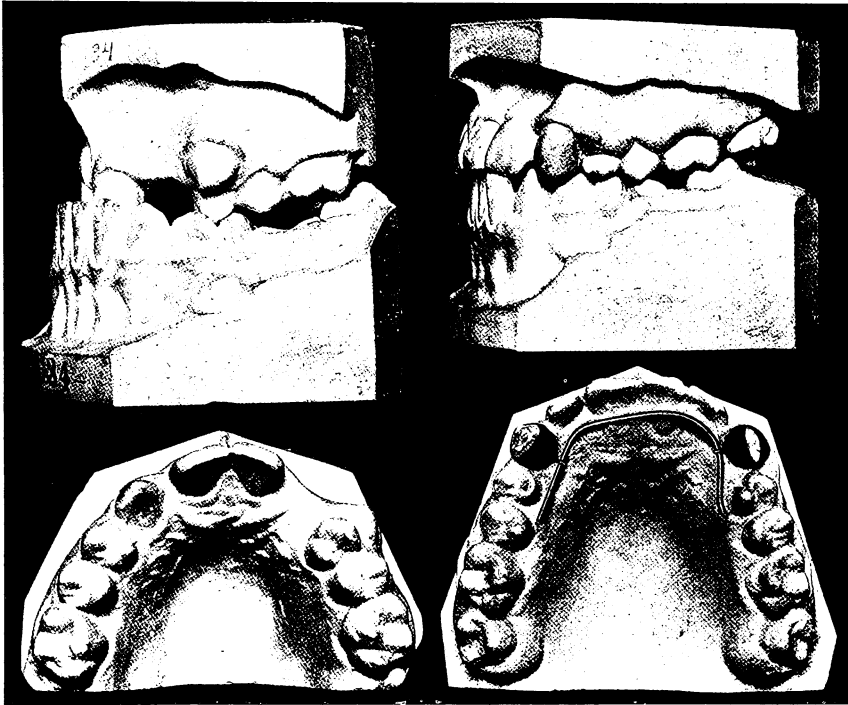


Fig. 25.

Fig. 26.

Bilateral and Unilateral Expansion.

Having described at some length the relations of force and resistance in the treatment of these rather complex cases, a brief description of the relations of force and resistance of the expansion arch in position for bilateral and unilateral expansion of the upper dental arch will enable us to round out the subject of efficiency as a special factor in the use of appliances for the correction of malocclusion.

In bilateral expansion of the dental arch it is desirable to take advantage of reciprocal force and reciprocal anchorage in such a manner as may be noted in Figure 27, in which the resistance on each lateral half

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of the dental arch is almost exactly balanced by such an arrangement of the appliance as tends to equalize the anchorage resistance.

The case shown in Figure 27 is one in which considerable lateral expansion is necessary, and, if treated in the ordinary way, using the first permanent molars for anchorage, a screw clamp band for support, and ligating the deciduous teeth on each lateral half, the resistance to lateral expansion would be at times greater on one side than on the other, due to loss of ligatures between sittings.

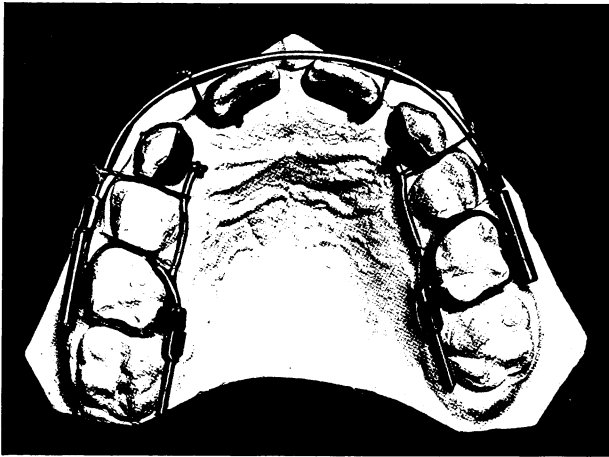


Fig. 27.

By using upon the deciduous molar a screw clamp band with a lingual wire extension, as seen in the cut, the lingual screw may be allowed to rest against the first permanent molar, and the lingual wire may rest against the lingual surface of the other deciduous teeth, when by ligation to the expansion arch, the entire resistance of each lateral half of the dental arch may be pitted against the other lateral half in bilateral expansion.

This control of the anchorage resistance enables a greater force of expansion to be used than otherwise, and is more comfortable than the usual method of ligating each tooth in each lateral half. The incisors in this case were banded in order that ligatures might be more securely placed, and thereby lose none of the force of the appliance. Here it will be observed that the gain in efficiency is at the points of delivery of the forces, which are just as important to consider from this standpoint as a gain in efficiency at the base of anchorage of the appliance.

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In Figure 28 is shown a somewhat similar reciprocation of force and anchorage resistance, using plain molar bands, with lingual extensions to the deciduous cuspids. This modification of Dr. Hawley's method of arch expansion seems to be the most ideal combination that the writer has used, so far as efficiency and comfort for the patient are concerned. With this combination there is no loss of resistance at any point; the first molar cannot move buccally before the deciduous teeth, as often happens, and the lateral expansion takes place uniformly and with precision.

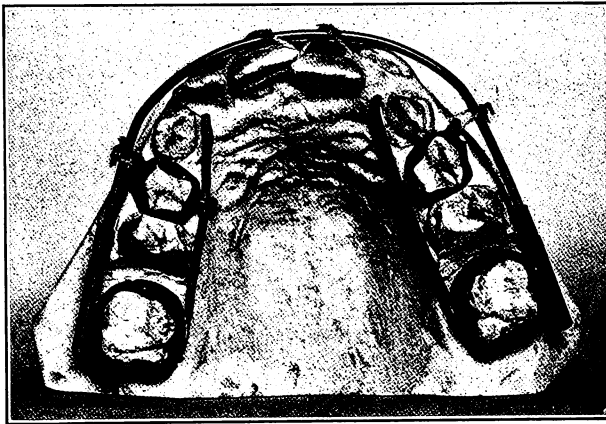


Fig. 28.

The value of this control of all of the resistance in one lateral half is of especial note in such cases as shown in Figure 29, in which the upper dental arch is in lingual occlusion in one lateral half. Treated as a case of ordinary bilateral expansion of the arch, the normally related half of the upper arch is more liable to move buccally than the half in lingual occlusion.

However, by pitting all of the resistance of the normally related half of the upper arch against that of the molar on the opposite side by means of the clamp band with the lingual wire extension, as seen in Figure 30, enough anchorage resistance is secured on the normal side to easily move first the permanent molar and then, consecutively, by ligating to the expansion arch, the deciduous molar and cuspid into normal occlusion relations.

The length of this essay forbids the descriptions of the efficient handling of force and resistance in other more extreme cases in which more detailed attention must be given to the re-enforcement of the an-

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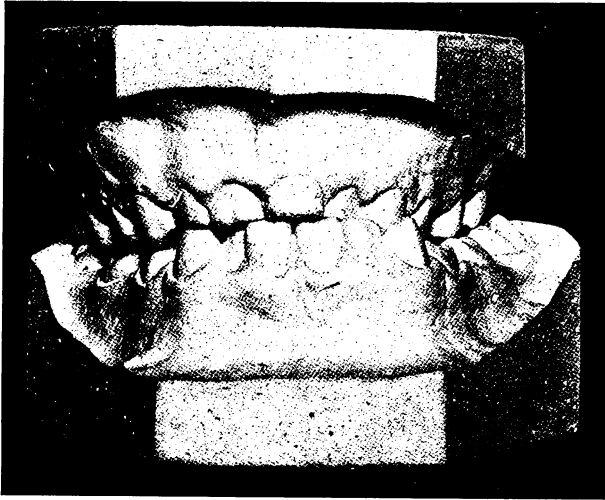


Fig. 29.

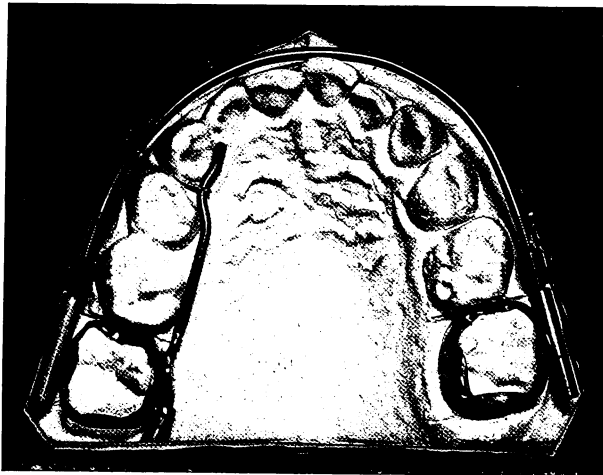


Fig. 30.

chorage, except the description of an auxiliary force and re-enforcement of anchorage in the very severe types of these cases of unilateral lingual occlusion illustrated in Figure 31. In this case the use of intermaxillary force and anchorage has been taken advantage of in a very unusual manner to enable the force and resistance to be properly proportioned.

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About three years ago the writer was treating an adult case of unilateral lingual occlusion, in which the usual methods of re-enforcement of the normal half of the upper dental arch did not seem to be adequate for the overcoming of the resistance of the half in lingual occlusion, be-

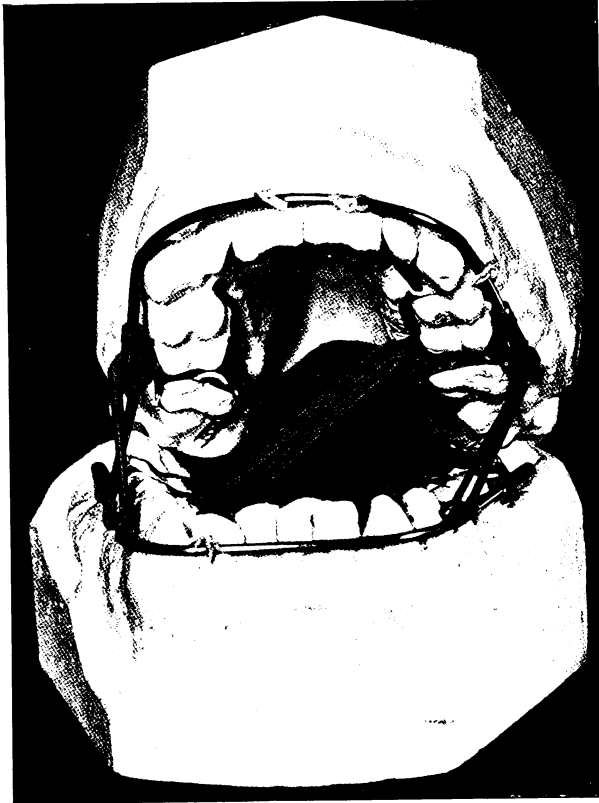


Fig. 31.

cause of the immense resistance of the deep and lingually inclined cusps of the lower molars, which seemed to effectually lock the abnormal half beyond the power of the expansion arch to budge it, but rather the force of the expansion arch tended to move the normally related half of the upper dental arch into buccal occlusion. Just at this time the idea of using the active force of the intermaxillary elastic from the clamp band of the molar on the normal half to the clamp band on the lower molar on the half in lingual occlusion suggested itself to the writer, and immediate advantage was taken of it with entire success.

The diagram in Figure 32 exhibits the intermaxillary force F changed into intermaxillary anchorage through its continued support of the normal relation of occlusion on the normal lateral half N , while the force of the upper expansion arch is increased proportionately. The lower expansion arch in this case is supposed to remain passive in position during the treatment above suggested.

In this essay an attempt has been made to point out and diagrammatically illustrate the inherent and auxiliary forces of the expansion arch and their proper control; the selection of proper resistance in some

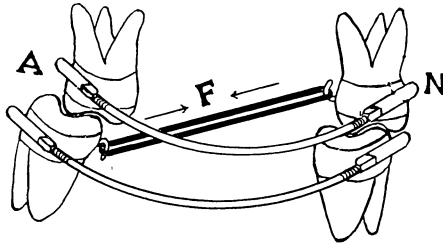


Fig. 32.

of the various forms of anchorage; the universal application of the expansion arch as compared with other appliances used for correction of malocclusion, and the conservation of force and anchorage, so that the least amount of energy shall be wasted through improper control of either force or anchorage.

Again, the expansion arch has been viewed from the standpoint of efficiency, and its conformation to the highest standard in this respect marks it as of the most universal application and of the greatest utility of any known appliance for the correction of malocclusion. A few improvements have been suggested, such as in the quality of the materials of its construction, the proper form of self-locking nuts, the self-locking arch, and the proper shape and fit of buccal tubes.

The measurement of the force of the expansion arch and the intermaxillary elastics so as to somewhat accurately determine the definite amount of force that is used in each has also been suggested as of value to the scientific handling and recording of the forces used.

Finally, several complex practical cases have been exhibited, illustrating all of the points brought out in the paper as regards the application of the expansion arch and its accessories, the selection of both force and anchorage for the individual case, and the proper control of force and resistance at all times during treatment, so that, by a proper use and conservation of each, the highest standard of efficiency might be maintained, and in consequence the best results of treatment assured.

The Elongation of Buccal Teeth in Class II.

By ALLEN H. SUGGETT, D.D.S., San Francisco, Cal.

I have been using an appliance for elongating the buccal teeth in cases of lack of vertical development that seems to be doing the work

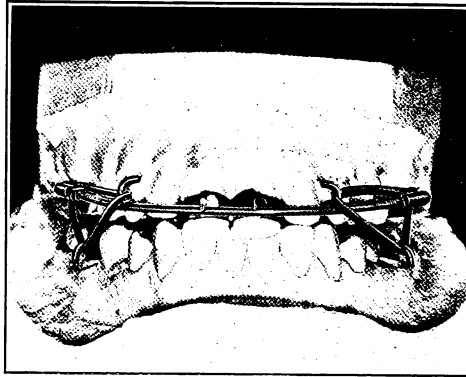


Fig. 1.

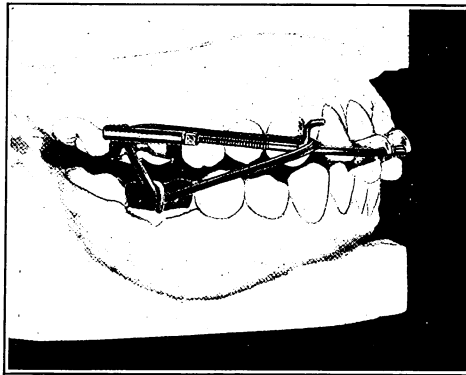


Fig. 2.

very satisfactorily. I got the idea from the excellent appliance of Dr. Rodgers which he exhibited at Denver last year.

I was much pleased with his, but I made a modification of it to suit a certain case, and on account of its simplicity have used it on three other cases since, with much satisfaction.

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After a Class II case has been reduced to a Class I, as explained by Dr. Rogers, the bite plane is cemented to the upper centrals and a spur is soldered to the labial surface. The D bands are left on the upper molars, and the arch with the sheath hooks is inserted upside down. The arch is slightly sprung down and slipped under the spurs on the labial surface of the bands on the centrals. This pressure will resist the effort of the molars to tip forward to their old position, as well as tend to press the centrals upward.

The bite plane has opened the bite and only the centrals occlude. A rubber band is passed over the sheath hook, on over the end of the tube on the molar and under a hook on the lower molar. (Figs. 1 and 2.)

The result of this pull is to elongate the molars, to retain the upper molars in distal position, and the spring of the arch exerts a slight upward pressure on the centrals.

The principal advantage, if any, that it may have over the excellent one of Dr. Rogers is its simplicity of construction.





President's Address.

By W. F. NAYLOR, D.D.S., Somerville, N. J.

Read before the New Jersey State Dental Society at Asbury Park, N. J., July 9, 1911.

Members of the New Jersey State Dental Society, and Guests—I deeply appreciate the many professional, business and social duties that all of you have laid aside to meet in this our annual convention, and, as your presiding officer, permit me to extend to you a most hearty and cordial welcome to these three days of “post-graduate study” in dentistry, and I sincerely believe that your presence will amply repay you, for I know this is to be the greatest meeting in the history of our organization.

The lateness of the publication of our annual program, which is most unfortunate, is a serious handicap to the interests of the society and its attendance, and to avoid a future delay of its kind I recommend that our official program hereafter be mailed not later than July 1st each year.

Too much praise cannot be given to the various committees for their work, which will contribute so largely to the success of this meeting.

Through the efforts of the Essay Committee, we will be permitted to listen to and discuss papers, which will be not only interesting and instructive to those present, but highly beneficial to the profession in general.

The Clinic Committee, I believe, should receive special mention, having obtained a greater number of clinicians than we have ever heretofore had, numbering ninety-six in all. This represents a great deal of hard work on the part of Dr. V. D. Rood, Chairman of that Committee.

The Committee on Exhibits must also be highly commended for its faithful work. The results of its labors are shown by the large number of interesting exhibits.

Viewing retrospectively my term as President, I realize that much of its success has been due to the earnest co-operation of the various committeemen, and I cannot find words in which to sufficiently express to them my feelings of gratitude.

The grim reaper, Death, has made a deep inroad into our ranks during the past year, and has taken from our midst one dearly beloved associate, Dr. R. M. Sanger, of East Orange, an ex-President of this society, whose presence and wise counsel will be greatly missed.

I deeply regret that we are also obliged to record the deaths of Dr. J. Hand, of Montclair; J. P. Eckel, of Washington, N. J.; Adolph A. Wise, of Newark, N. J., and John D. Ballard, of Orange, N. J., all active members of the New Jersey State Dental Society.

**Public
Dental
Clinics.**

It is with pride that I am permitted to announce that our State, of which we are all justly proud, has demonstrated its progressiveness by enacting a law (and in this respect leading other States), Bill 229, empowering cities to add to their annual tax levy an appropriation for the employment of dentists for Free Dental Clinics, for the indigent poor, every and all day. Proud we may be of the establishment of so important and truly benevolent an object; but we must not stop here; this is only a means of repair and cure. We understand the science of repair, we also recognize the advancement along the lines of oral and dental cleanliness as a means, and proud we are of the men who have discovered the process of tooth disintegration, but as to the prevention of that process we should now direct our attention, and along this line, and in conjunction with, our State Board of Education, I would suggest that means be adopted by this society to advance the work of educating the public as to the care of the mouth and teeth, through such efforts as public lectures aided by the stereopticon.

In this connection we should also consider the very important subject of the examination of the teeth of the children in our schools. Efforts are being made in many localities to establish, by law, school dentists the same as we now have school physicians. There should be as many school dentists as we have school physicians, because the public is beginning to recognize the equal importance of both in our schools. I would recommend that this be taken up by our Legislative Committee, and that they present the subject in proper form to the legislaturè.

It is in the schools of our country, private, public and parochial, that the fundamental teaching and training as to the physiology, pathology and therapeutics of the teeth and associate parts should begin by the adoption of text-books in our schools dealing with those subjects.

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Dinner to Dr. Eaton.

Let us briefly take cognizance of the complimentary dinner given in honor of one who has served the public in his chosen profession more than a half century, one who has served the State society as its president, and wish him Godspeed. We trust that he may have another half century of usefulness. I refer to Dr. A. E. Eaton, of Elizabeth.

Educational Standards Raised.

Great credit is due to our Legislative Committee for its successful efforts in legislative work during the past winter. As a result of its labors we have a law duly enacted raising the standard of preliminary educational requirements for the practice of dentistry in this State.

Section 3. Under the head of examinations the old law required as preliminary education "that furnished by the common schools of our State."

Section 3. Under the head of examinations, the new law requires a certificate from the Superintendent of Public Instruction showing that before entering a dental college he or she had obtained education consisting of a four years' course of study in an approved public or private high school or the equivalent thereof. This to take effect January 1, 1914.

This is very commendable, and will receive the hearty approval of every dentist in our State.

In connection with the raising of the standard of preliminary education, I desire to emphasize the importance of an additional year to the college course, making the term four, instead of three years, and with such action on the part of our dental colleges, our State boards of examination could give better reports of their work. To do this will require, and I would recommend, that a permanent committee of three members be selected to confer with similar committees of other States to endeavor to bring about this improvement.

We regret to report the following resolution offered by our State Examining Board December 7, 1910. The New Jersey State Board tenders its resignation as a member of the National Association of Dental Examiners. It seems unfortunate that such action was deemed necessary, although the Board adopted the resolution, seemingly all of one opinion.

Our Committee on Ethics have some matters to investigate, which I hope will be accorded the careful and most thorough consideration which they deserve.

Jury Duty.

Our Legislative Committee have been inactive in the matter of exemption from jury duty for dentists. I would suggest that this committee make a special effort to have such a law passed at the next session of the legis-

lature. Our neighboring State, New York, has such a law, and there would seem to be no reason why the profession in New Jersey should not be protected in like manner.

**Press
Committee.**

There is a desirable publicity which would serve the interests of the State society, and an undesirable publicity, which serves only the interests of the individual, therefore, I recommend that all news concerning our society, given out for publication in the press, must be endorsed by the Press Committee.

**Initiation
Fee.**

Another recommendation I am pleased to bring before you at this time is the dropping of the initiation fee of \$5. We will defeat our real purpose if we continue to adhere to this fee. Our dues being \$4 a year, many are of the opinion that we can well afford to make the total first cost of new members \$5; in other words, making the initiation fee \$5, including the first year's dues.

**Exhibition
Space.**

The avidity with which exhibitors seek space at our Annual Convention is quite remarkable. Our meeting place is ideal, with sufficient room and good light, is well located, and the attendance is excellent. In reviewing other State meetings, I learn that with no greater attractions or accommodations the cost per foot for exhibit space is more than our charge of \$1.50 per foot; therefore, it is reasonable to advise an increase in the cost of exhibit space, and I would suggest that action be taken at this meeting to obtain this result.

**Unlicensed
Practitioners.**

Praise must be given the thorough and consistent work of our Examining Board, in its endeavor to rid our State of the unlicensed and unscrupulous men who defy the law and deserve the full punishment prescribed. It is to the Board of Examiners that we look for protection, prosecution and relief from these conditions.

**Army
Dental Corps.**

For the general information of the dental profession, who have deferred entering the service in the United States Army Dental Corps, I would direct attention to the Act of March 3, 1911. A bill to improve the status and efficiency of the dental surgeons in the United States Army was passed by Congress and approved by the President. It is a very fair law, and one in which all should be interested enough to read.

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Reorganization of the National.

At the Denver meeting last July, a committee on the reorganization of the National Dental Association was appointed, and that committee was instructed to request each State society to appoint a representative, who should act as a delegate, to what might well be termed a Constitutional Convention, to inform the committee as to the wishes of his individual society. Several States have already passed resolutions appointing a delegate to the Cleveland meeting in July, 1911, therefore I would suggest that the New Jersey State Dental Society select a delegate who will attend the meeting of the National Dental Association with instructions and power.

Reorganization of the State Society.

The sympathetic unity of purpose is essential to existence and success in all social and fraternal bodies. The adjustment and re-adjustment of like and unlike elements and ideas must be recognized as a result of the law of evolution. The complexity of modern or present conditions, and our professional needs, are becoming so great that, in the words of one of our late scholars, "It is a condition, not a theory we must meet"; let us, therefore, be thoroughly democratic in our ideas and apportionment of responsibility in our State organization. I refer to the clause contained in the annual address of three former presidents; that relating to the small membership of our society, and the recommendations for reorganization of the society.

Influenced only by my deep interest in the success of the Association, and considering its welfare alone, a sentiment which has always governed me in all my official acts, I am persuaded, as have been some of my predecessors and many of my colleagues, that its future lies in quite a radical change in our organic law, and I look forward to such action with confidence and sincerity. For it is clear that the future hope of our society lies in her sons. The Dental Society is the fountain head from which the social life of this profession is sustained.

Therefore, let us strive to instill more energy into our advantage of fraternalism, in so doing better our personal condition, increase the bonds of good fellowship and love, stimulate our higher ideals for the best there is in all of us collectively, and strive ever to plant the emblem of our noble profession upon the highest pinnacle of success.

A Plea for a Return to the Use of the Porcelain Inlay.

By FRANK E. CHEESEMAN, D.D.S., Chicago.

Read before the New Jersey State Dental Society at Asbury Park, N. J., July, 1911.

The trend of most of the literature written during the past three or four years upon the subject of operative dentistry has been to condemn the use of porcelain as a filling material. Some of these writers are men of great prominence in the profession, whose views on dental subjects are usually sound and worthy of careful consideration, but whose clinical experience with this material, however unfortunate, does not justify the ultimatum expressed in their papers: It appears that they are attempting to limit the practice of this method, either to what may have been their own experience with it, or to their observation of the failures of other operators who were not familiar with the underlying principles governing its use, thus promulgating and spreading broadcast the erroneous idea that porcelain cannot be depended upon to save carious teeth, especially when subjected to masticatory stress.

College Teaching of Porcelain Inadequate.

Those in authority at the various dental colleges also seem to be so prejudiced against this method that the facilities provided for their students to acquire this difficult technic are absurdly inadequate. This fact has been caustically commented upon by a great number of their graduates, many of whom (because of their recognition of the growing demand for cosmetic dentistry) have received a special course of instruction in this mode of filling teeth. As a consequence of these merely personal opinions, together with the attitude of those in charge at the dental colleges, and the lack of application to, and study of, the details and technic necessary to practice successfully this method by the great majority of practitioners, the use of porcelain has become so minimized that it is commonly limited to large labial cavities in incisor teeth, to meet extreme cosmetic requirements, if used at all.

In the face of this preponderance of opinion, it is essential that a strong protest should be made, to the end that practitioners may be encouraged anew to study the possibilities of this material. This will undoubtedly save from being relegated to oblivion this beautiful art, which, if employed successfully, is doing more than any other one thing to dignify the practice of operative dentistry.

Those who have been using porcelain as a filling material to any extent have learned by experience that a special method, requiring a separate technical training, is necessary, if exact and permanent results

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are to be obtained. Indeed, it may be stated that greater application is demanded (if we wish to practice successfully this method of filling teeth) than that, either for the gold foil or the gold inlay methods.

Essentials of Success with Porcelain.

The first three or four years of the writer's experience in the use of this material was the most trying period of his professional life. There were many failures (due to improper cavity preparation and general inexperience), with the attendant loss of confidence and patronage of some patients; yet, for those failures no regret is now felt, because, as a result, he was enabled to learn what is believed to be the essential requirements for the successful practice of this method of filling teeth, which are as follows:

First.

The cavity must be so shaped, and must have such retentive form that the inlay, when cemented, will resist all force directed against it.

Second.

In all classes of cavities, enamel walls that are unsupported by dentine must usually be removed, to the extent necessary for gold operations.

Third.

The cavity must be so formed that there shall be no attenuated area of porcelain, as such area is liable to become fractured, resulting in the failure of the operation.

Fourth.

The inlay must fit perfectly all portions of the cavity, and for this result exact adaptation to the cavity walls is most essential. As one of the basic details, a perfect-fitting matrix must be used, one that will not become distorted as a result of the shrinkage of the porcelain during the fusing process.

Fifth.

The inlay must be colored so as to simulate as nearly as possible the appearance of the tooth in which it is to be placed.

Sixth.

The inlay must be shaped so as to restore perfectly the lost portions of the tooth; thereby re-establishing normal conditions.

Seventh.

To bring out the maximum strength and coloring of the porcelain, careful fusing is required.

Eighth.

Porcelain fillings that are to be subjected to stress require bulk for strength.

Cavities Suitable for Porcelain.

With the foregoing points in mind, I wish to advocate its use in the following classes of cavities, when indicated for cosmetic reasons.

First. Porcelain should always be used in cavities where the filling will be exposed to view in the twelve anterior teeth, with the exception of a few cases in the lower incisors. The practice of filling approximal cavities in incisors with gold without bringing that material into plain view, where it can be kept polished by the action of the brush, is to be condemned for the very good reason that gold in these situations soon becomes tarnished, presenting the appearance of decay, and arousing the suspicion that teeth so filled are in need of dental service, and yet, gold foil has recently been advocated as a substitute for the use of porcelain in these situations.

Second. It may be used in simple fissure cavities in the lower bicuspid.

Third. It may be used in upper bicuspid and first molars, where extensive caries necessitates the restoration of a large portion of the buccal wall. Porcelain is especially indicated if these teeth are pulpless.

Fourth. It should be used in all buccal cavities, not only because of its compatibility, greater than that of any other filling material (and this is often of much importance in these situations), but because of its glazed surface, which in all localities is such a strong defense against recurrent caries. Its use in these cavities is also a substantial aid to prophylactic treatment, a department of dental service that has deservedly received much attention during the past few years. For these reasons gold is almost always contraindicated in this class of cavities.

Fifth. It may be used in deep occlusal cavities in the lower first and second molars. Also in those teeth where preferably the approximal walls are intact, for those patients who are fastidious, or when appearance is of great importance.

Its use is especially indicated in occlusal or occluso-mesial cavities in lower second molars, in the mouths of those who have lost the first molars early in life, thereby allowing the second molar to tip forward. In these cases there is no occlusal force directed against the tooth except at the distal cusps, so that the margins of an inlay in this class of cavities are subjected to no more stress than those in the approximal surfaces of incisors. Surely these are typical cases for the successful use of porcelain in the posterior teeth.

This classification is by no means an arbitrary one, but the use of porcelain is recommended for the cavities mentioned in which a display of gold would be objectionable.



If the operator does select porcelain as the material to be used for the posterior teeth, care must be exercised that all the conditions necessary for a successful operation are presented, as, with the exception of buccal cavities, the use of porcelain because of its bulk requirement is contra-indicated in more than ninety-five per cent. of all operations in these situations.

Cavities in Molars and Bicuspid in Which Porcelain Should Not be Used.

The unfavorable conditions for the use of porcelain inlays in these teeth include those cavities in molars where the buccal wall has become undermined only to the extent that it is necessary to cover it with a small amount of filling material as a protection against lateral and occlusal stress. Here it is manifest that a small bulk of porcelain would be inadequate as a protection for the tooth, because it would soon become fractured as a result of occlusal stress. If porcelain were to be used in these cases it would be necessary to destroy a large amount of the involved wall in order to obtain the great bulk of the porcelain necessary to withstand stress. This extensive destruction of good material would not be justifiable, as the amount of gold exposed would not be objectionable in the great majority of cases.

Nor should porcelain be used for those cavities in the approximal surfaces of bicuspid, in which caries is not extensive, and where the preparation through the occlusal surface only requires the removal of the fissure, and the securing of anchorage. In these cavities gold should be the material selected, as the preparation would necessarily be much more extensive if porcelain were chosen to fill these teeth.

Its use for fissure cavities in lower molars is also contra-indicated unless the decay has extended pulpally to a point where a sufficient bulk of porcelain may be secured. If such is the case the decay usually will have extended toward the side walls to a point that will allow for the paralleling of these walls, the securing of a flat base, and a large area of porcelain.

Preparation of Cavities.

The success of filling operations in the natural teeth must depend fundamentally upon correct principles of cavity preparation. The gradual decline in the use of porcelain inlays is attributable more directly to incorrect methods than to any other cause. It is believed that the majority of those dentists who have practically abandoned the use of porcelain as a filling material would again become enthusiastic in its proper use, if it was felt that dependence could be placed upon absolute principles of preparation that would insure retention as certainly as that

provided by the principles governing scientific cavity preparation for gold fillings.

I am hopeful then that the principles about to be outlined will recommend themselves as being scientific, and that it will be recognized that if perfect fitting inlays are placed in cavities prepared in the manner described, that they will resist dislodgment as surely as will the gold foil fillings.

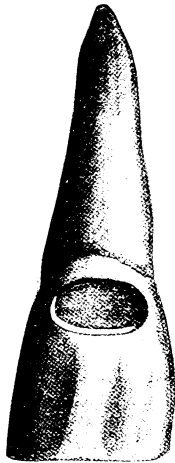


Fig. 1.

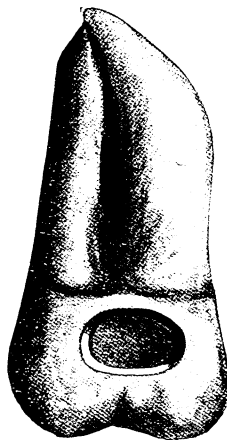


Fig. 2.

Labial and Buccal Cavities.

The first class of cavities that will be considered are those upon the labial and buccal surfaces of the teeth. There has been more complaint from both the profession and the laity, that inlays placed in these cavities are liable to become dislodged than from any other class of cavities in the mouth. As inlays in these cavities are subjected to a minimum amount of dislodging force, it is reasonable to assume that the cavity preparation in general use has been faulty. The relief, then, must come from a radical change in our methods for securing retention. The general principles of preparation (which will follow a description of the methods now employed) are therefore recommended, as they have been demonstrated to be correct after an extensive clinical experience.

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The usual procedure has been to render the outline either semi-lunar or oval in form (Figs. 1 and 2). This formation does not admit that all the walls shall be either parallel or at right angles to each other, and this is generally recognized by the profession to be an essential requirement for the retention of the inlay. When speaking of parallel walls and sharp angles, it is not meant that they shall be exactly parallel, but that they shall be approximately so, as there must be sufficient divergence to allow for the withdrawal of the matrix without distortion. Also the

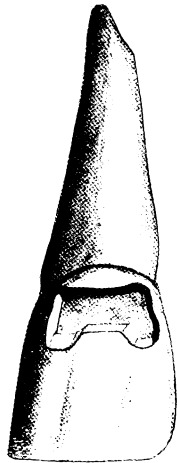


Fig. 3.

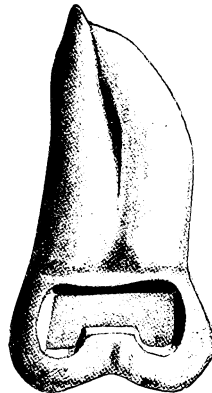


Fig. 4.

lines of the angles at the periphery must be slightly curved in order to obtain a perfect matrix. It is recommended, then, that an extension at both the mesio- and the disto-approximal angles towards the gingivæ be made, which will result in a flat seat instead of one that is concave in form. There should also be a right angle extension of these angles toward either the incisal or the occlusal region, forming a staple outline, with all the walls either parallel or at right angles to each other (Figs. 3 and 4). These extensions also provide for greater surface or frictional retention. Inlays placed loosely in cavities formed in this manner become more firmly seated under force exerted from any direction.

These cavities should be prepared so that they will have a flat base, if this is possible. However, it is often necessary that the base shall be convex in form, as a flat pulpal wall would often impinge upon or even expose the pulp. The side walls must be as nearly at right angles to the pulpal wall, as will admit of the withdrawal of the matrix without dis-

tortion, thereby securing in the completed inlay practically as much bulk of material at the margin as at the base of the filling, thus avoiding attenuated areas of porcelain.

**Approximal
Cavities in
Incisors.**

The preparation for approximal cavities in incisors and cuspids should be as follows:

If the lingual wall is supported by dentine the usual concave outline on the labial surface should be extended at both the gingival and incisal angles,



Fig. 5.



Fig. 6.



Fig. 7.

obtaining a slightly convex instead of the concave labial outline in general use (Fig. 5). These extensions, as will be seen, allow for the paralleling of the labial and lingual as well as of the incisal and gingival walls. The axial wall will then be at right angles to all of these walls. The convex labial outline secures even more resistance against force than one that is parallel with the lingual wall. Figs. 6 and 7 show the approximal and lingual preparation for this class of cavities.

In this form of preparation the matrix is removed and the inlay is inserted from the labial surface.

It is my belief that all of the former methods of preparation for this class of cavities (at least those which I have seen described) have been incorrect, as the labial half of the cavity, including the axial wall, has been more or less saucer-shaped because of the concave labial surface. It is really remarkable that so many inlays, placed in cavities prepared in this manner, have resisted dislodging force.

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The concave labial outline (Figs. 8 and 9) is an inheritance from the gold-foil days, and it seemed feasible to all of us that any form of preparation that would retain gold foil should necessarily be sufficient for the retention of an inlay.

However, we have not taken into consideration the fact that when gold was placed in cavities prepared in this manner, some form of interlocking was employed, and that practically no dependence was placed upon the labial wall as a means of retention.

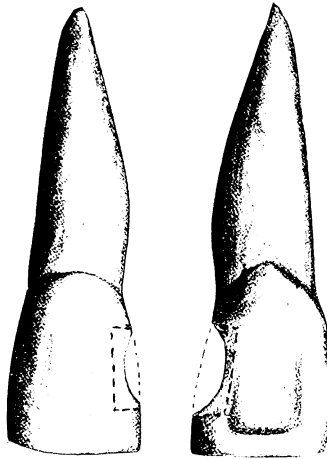


Fig. 8.

Fig. 9.

The use of the inlay method for these cavities allows for no such means of retention, so that we must depend entirely upon parallel walls, sharp angles and a box form of preparation.

Large Approximal Cavities. The preparation for large approximal cavities in the anterior teeth in which the lingual wall is unsupported by dentine is as follows:

The lingual wall should be removed and the cavity extended lingually to a point where a step may be secured, for it is practically impossible to dislodge the cemented inlay from a cavity prepared in this manner. In this class of cavities it is not so necessary that the labial outline shall be convex (although the angles should be extended), because the step portion will resist all attempt at displacement. In this form of preparation the matrix is removed, and the inlay inserted from the lingual surface (Figs. 10, 11, show such lingual and

approximal views of such a cavity in a cuspid, and Fig. 12 a similar cavity in a lateral incisor).

The two classes of cavities just described are those in which porcelain inlays have been generally used by a large majority of those dentists who are using this method at all, and confidence is felt that the adopting of the principles of cavity preparation just described will eliminate many of the difficulties that may have heretofore been discouraging features in the use of this material in these situations.

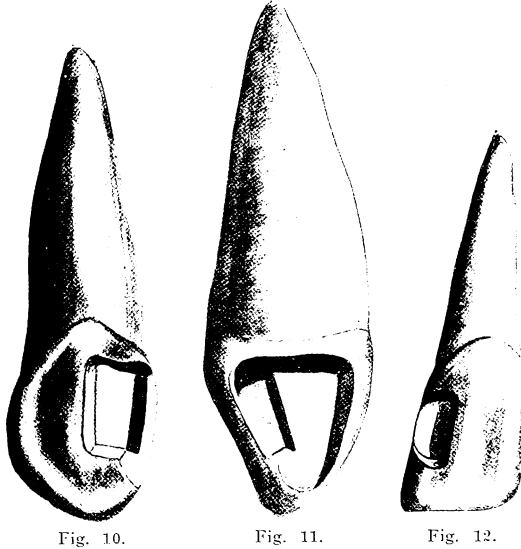


Fig. 10.

Fig. 11.

Fig. 12.

**Approximal
Cavities in
Lower Incisors.**

Owing to the fact that cavities in the lower incisors are usually shallow, and that there is generally a small amount of dentine present, it is difficult to obtain sufficient anchorage in the cavity proper without serious danger of exposing, or at least of impinging, upon the pulp. It is, therefore, recommended that the walls be paralleled, as nearly as possible, without endangering the pulp, but that entire dependence for anchorage be placed upon a dove-tail extension on the labial surface that shall be cut well through the enamel, the dove-tail extending towards the mesial or distal wall, as the case may be (Fig. 13). The characteristic formation of the lower cuspids necessitates that this same procedure be employed.

Entire certainty may be felt that this form of preparation will securely lock the inlay to place, and it has been of invaluable assistance to me in the handling of these cases.

For incisal restorations the usual lingual outline of the cavity (Fig. 14) should be extended at the gingival wall, so that a broader seat and a firmer anchorage will be secured. It should also be extended lingually at the median third of the tooth, securing a dove-tail form of preparation, which practically solves the problem of retention in these troublesome cases (Figs. 15 and 16).

The reason for the use of the dove-tail extension toward the median third of the tooth is that most of the force directed against the inlay is



Fig. 13.

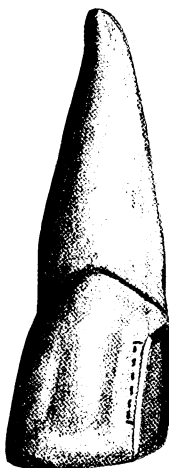


Fig. 14.

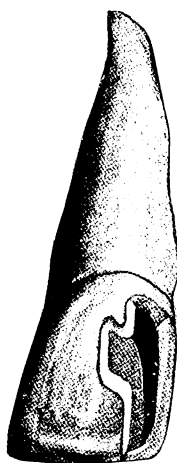


Fig. 15.

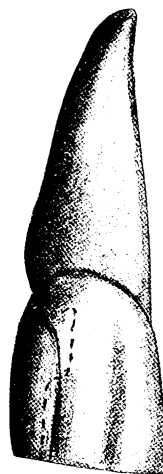


Fig. 16.

from the lingual and the incisal surfaces, and there being practically no support from the labial wall the inlay is liable to be pushed from its position. Following the use of the dove-tail extension, which should be generous in proportion, the force will be directed against the most resistant portions of the tooth. The lingual extension at the gingival wall provides for a long flat seat as well as increased frictional or surface retention. Sufficient separation should be secured, so that when the tooth returns to place there will be a firm contact with the adjacent tooth, which will help to resist lateral stress. For those teeth, of course, where there is a natural separation, this cannot be done, as the symmetry of the teeth would be destroyed.

Cavities in Vital Upper Cuspsids.

The preparation for vital upper bicuspsids in which the buccal wall has been partially destroyed is as follows:

The buccal, lingual and axial walls should be nearly at right angles with the gingival wall. The

step portion through the occlusal surface of the cavity should be extended pulpally, and, if necessary, buccally and lingually to obtain sufficient bulk to withstand stress; if these teeth are pulpless, the same preparation is used, with the exception that the base is allowed to include the sub-pulpal wall.

This right-angle preparation insures practically the same amount of porcelain at the inlay margins as at its base, and (as was said before, and should be emphasized) it is the fundamental requirement for a successful operation.



Fig. 17.

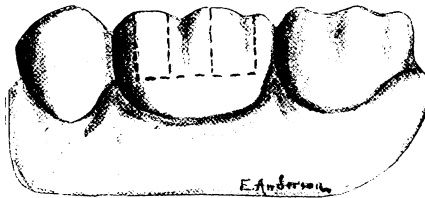


Fig. 18.

Fissure and Occlusal Cavities.

The preparation for simple fissure cavities in the lower bicuspid and for deep occlusal cavities in the lower first and second molars is simple and corresponds to that used for labial cavities with flat seats, but care must be taken that an opportunity for a sufficient bulk of material at the inlay margins should be secured, as these fillings will be constantly subjected to stress (Figs. 17 and 18).

Pulpless Upper Molars.

The preparation for cavities in pulpless upper first molars, where the mesio-buccal wall has been destroyed, is as follows:

The mesio-buccal wall should be extended gingivally to a point where the line of demarcation between the inlay and what remains of that wall is always hidden from view. The axial wall should be nearly at right angles to this wall. The preparation should be carried through the occlusal surface to include the distal fissure, leaving

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the lingual and disto-buccal walls almost at right angles with the gingival and sub-pulpal walls. The occlusal preparation forms a natural step, which should be extended gingivally to a point where sufficient bulk can be secured, and this may be done without endangering the strength of the tooth (Figs. 19, 20, and 21).

It is in this class of cavities that most satisfactory results have been obtained. A great number of inlays in these situations having had a

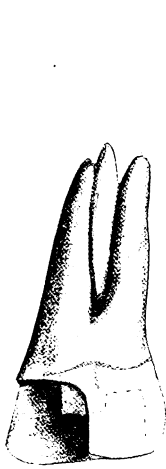


Fig. 19.

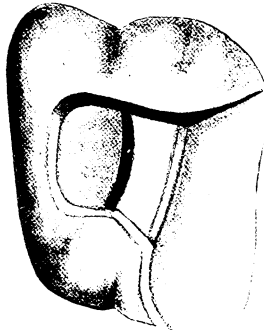


Fig. 20.

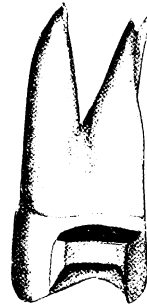


Fig. 21.

clinical history of several years of masticatory service, without any indication of fractures, recurrent caries, or dislodgment. By appointment it will be my pleasure to show in the mouths of patients a sufficient number of inlays, giving their history, to convince the most skeptical that porcelain used in carefully selected cavities is on a par with gold as a conservator of teeth, and those who are most prejudiced against its use must admit that there can be no comparison from an artistic standpoint.

Matrix Material and Remarks Upon the Two Methods of Obtaining Matrices.

The material recommended for matrices is platinum, and its faulty adaptation to the cavity walls is one of the principal reasons for many of the failures charged to the porcelain method. The requirement for its use is that it must be perfectly adapted to all cavity surfaces, and the operator must either prevent its warpage or be willing to correct this defect, which may be caused by the shrinkage of the porcelain during the fusing process. If the porcelain is not perfectly adapted to the walls of the tooth (this adaptation being the province of the matrix material),

or has not sufficient bulk at the points of stress, there will be a fracture; not because of any inherent weakness of the material, but due to improper cavity preparation or to some faulty manipulation by the operator.

It is my belief, after having given both methods a thorough trial, that the direct method for obtaining matrices is more accurate and satisfactory than the impression method. For large restorations it is of invaluable assistance, because the excess of platinum assumes the form of the remaining portion of the tooth, thus providing a perfect guide for contour and occlusion.

If the impression method is used in these large cases, a plaster-of-Paris or modeling compound impression and bite are necessary for this guidance, as the matrix which results from this method has no outline form that will serve this purpose.

For a few simple approximal cavities in opaque teeth, low fusing porcelain is indicated, but the use of platinum is still recommended, as it is a more dependable matrix material than gold.

**Correcting
Faults Due
to Shrinkage.**

A discouraging factor in the handling of large complicated operations in the posterior teeth has been that it is practically impossible to obtain a perfect-fitting inlay from the original matrix. This is due to the difficulty of overcoming the warpage of the matrix material incident to the shrinkage of the large bulk of porcelain necessary to withstand stress, and this may be the reason why many careful operators have abandoned its use in these situations.

In these cases it should not be expected to obtain a perfect result from the original matrix, nor, of course, will it avail to construct an entirely new inlay, as the same difficulty will be presented.

The procedure is to complete the inlay, over-building slightly the porcelain, at the contact point.

After the removal of the matrix, grind sufficiently to obtain a small and snug contact with the adjacent tooth. The inlay is then placed in the cavity, and observation is taken of the point or points, where the porcelain may have bulged, over-filling the cavity. This is reduced by grinding the filling at these places to a point well below the margin of the tooth. Also note where the porcelain, because of the warpage of the matrix, does not reach the margin of the tooth. The porcelain is reduced at these points so as to increase further this defect. The reason for this is that allowance must be made for a sufficient bulk of added porcelain with which to obtain a perfect fuse to the original mass. Also note whether there is any necessity to correct the occlusion. A new matrix is now made, which, when completed, is left *in situ*, and the imperfect product of the parent matrix is forced to place and thoroughly

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seated, and this will usually require considerable pressure. The porcelain and the matrix are now removed from the cavity. The matrix is grasped by the plyers and the porcelain jarred to a perfect seat in the matrix, which can be accomplished without exertion of force. With a slightly lower fusing porcelain mixed rather thin, the inequalities are now filled in, the imperfections of the occlusion corrected, and the added porcelain fused to the original mass.

The usual result is an inlay having perfect adaptation, although it is sometimes necessary to resort to the third matrix. This does not take as much time as the description would indicate, as an experienced operator requires no more than ten to twenty minutes in order to obtain a matrix for the most complicated cavity, and the satisfaction expressed by the patient is ample compensation for the extra labor involved.

The Obtaining of Color Effects.

This paper has assumed such proportions that only a brief description will be given of this most important and interesting detail of our inlay operations. I am hopeful, however, that the discussion will bring out other phases of the subject that are not mentioned here.

In my practice two shades of yellow and one shade of white, brown, gray, blue, and occasionally gum enamel are used. Some years ago the use of the shade guide was abandoned as being too confusing, and since that time entire dependence has been placed upon observation of the tooth to be filled.

As we all know, the gingival third of the tooth is usually a shade of yellow or brown. The median third is usually of a lighter shade of the predominating color at the gingival in dark colored teeth, and in light colored teeth it is usually white with an underlying shade of yellow showing through the white.

The incisal third usually shows more or less of the gray or blue. This classification cannot always be depended upon, as those teeth having thick incisal surfaces may not show any trace of blue or gray, the color of the median third continuing through the mesial third. The blue and gray is increased in intensity with the decreased bulk of dentine at this point.

It is important, then, that the predominating color and shade of any region of the tooth shall be simulated in the corresponding region of the inlay, so that an inlay involving both the gingival and the median third should be darker at the gingival than at the median third, and if we are to make an incisal restoration a part of the incisal third would usually require the addition of gray or blue.

We must not forget, however, that the gray and the blue, because

of their intensity, will require considerable modification (this being accomplished by the use of both the white and the yellow colors), as without this modification the entire effect would be destroyed.

When using blue or gray, no attempt should be made to place any other color at the same baking, because if there happens to be any mixture of the powders the lighter colors will become absorbed.

Because of their intensity a thin layer, modified by the white and sandwiched between the yellow layers, is usually sufficient to bring out the desired effect.

What I believe to be the simplest and most satisfactory way of placing colors is what might be termed the sandwich method. This is easily acquired, is not as confusing as the layer method, and the operator is able to prognose to a great extent the appearance of the completed inlay; with the layer method my personal experience was that I never knew what the color was to be until the matrix was removed, and then I did not know what effect the cement would have upon the inlay.

The technic is as follows:

Suppose we are to place an inlay in a central incisor involving the gingival and median third of the tooth; the first bake would contain a layer of yellow across the lingual surface; the second bake a layer of white, which would be of varying thickness, according to the intensity of the shade of the tooth, being thinner, of course, at the gingival than at the median third. This, however, must be a matter of judgment in individual cases; the last bake would be with another layer of yellow, thus forming the sandwich, with the predominating color on the surfaces, and with the certainty that the color will be right. The success obtained in the shading of that color depends upon the personal equation.

If the filling involves the incisal surface, it will probably be necessary to place a layer of blue or gray in that region. Care must be taken, however, that these colors shall be modified to the extent that they will simply show through rather than absorb the lighter colors.

When it is necessary to place inlays in labial or buccal cavities that have been extended beyond the gingival line, and where there is any recession of the gum tissue, it is advisable that gum enamel be used for that part of the cavity extending beyond that line, using tooth colors in the remaining portion of the cavity, and carving the inlay so that a natural effect is secured. The shade of the gum enamel can be modified by the use of the Lennox stains (to be mentioned later), so that it will simulate the appearance of the natural gums. The use of tooth colored porcelain entirely in these cavities does not result in the artistic effect that may be obtained from this combination of colors.

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The Fusing of Porcelain.

The fusing of porcelain is a very important factor in this work, and the use of the pyrometer attachment to the electric furnace is recommended, for more exact results can be obtained without regard to the vagaries of the electric current, and without the strain upon the eyes, incident to the use of cones and gold pellets.

The tendency of many operators is to overfuse the porcelain, which renders it friable and destroys the coloring matter. Therefore, if any doubt exists as to the exact fusing point, it should be preferably slightly underfused.

Shading with Stains.

There is a tendency among even the most experienced operators to use colors of too light a shade, this being especially true in the making of large restorations. This defect may now be corrected by the use of the Lennox stains, as described in a paper written by Dr. F. E. Roach, of Chicago, read before the Illinois State Dental Society in May, 1909, and published in the *Dental Review* of September, 1909.

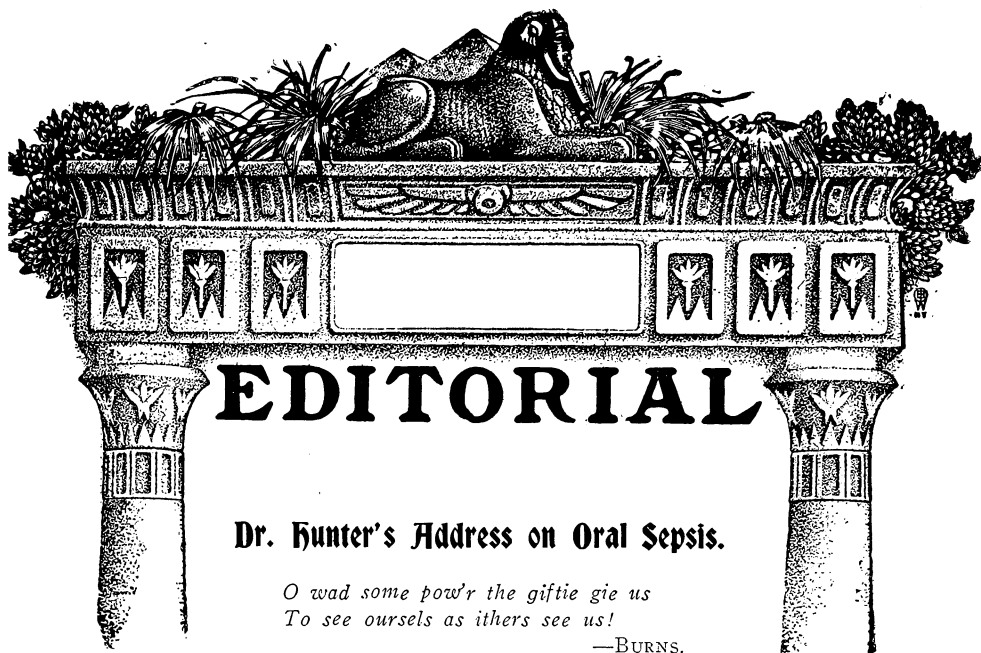
This method of changing the color and shade of porcelain is invaluable not only for inlays, but for obtaining artistic and natural effects in the construction of crowns and artificial dentures; and a careful study of this paper is recommended.

I trust that the impression has not been given by this paper that I am an extremist in the use of porcelain, for, as a matter of fact, more than ninety-five per cent. of my operations in the posterior teeth (with the exception of buccal cavities) are with gold. The point to be emphasized is, that in the classes of cavities described, porcelain may safely be used, if it seems desirable from a cosmetic standpoint.

This plea is made to the profession, that it may again turn its attention to the use of this material, and restore it to its rightful place as an invaluable adjunct to the department of operative dentistry, for it is the only durable material with which we are able to simulate in any degree the appearance of the remaining tooth structure.

When selecting the material to be used, it would be wisdom on our part to take into consideration the fact that a mechanically perfect and durable gold operation (if in an exposed situation) is offensive and distasteful to people of refinement and culture.

A few last words to those practitioners who are endeavoring to simulate natural appearances in their dental operations, including the use of porcelain inlays in exposed situations, the construction of crowns that are harmonious not only in the shading, but in their anatomical relationship to the natural teeth, the reproduction (on their exposed surfaces) of the characteristic defects of their neighbors, if there are any, and the arrangement, shading, and staining of the teeth used for artificial dentures. To such I can safely promise the gratitude and confidence of discriminating patients.



Immediately after the appearance of the August issue of *Current Literature*, the writer began to receive letters enclosing an article clipped from that magazine, entitled, "An English Physician's Denunciation of American Dentistry," coupled with urgent requests that he should reply to the same. Apparently many other dental editors have received similar communications, since the dental journals for October fairly bristle with responses to the alleged "denunciation," all of which, in a greater or lesser degree, "deny the allegation and defy the alligator."

It is more than apparent that the "Constant Readers," and others who have insisted that their favorite dental editors should take their pens in hand, and make answer to that rash Englishman who has made an attack upon American dentistry, did so with full knowledge of the great poet's claim that the pen is mightier than the sword, and in the hope and expectation that the daring Briton would be treated as were his forbears in the previous wars between his country and ours. Let us hope that the wrath of the dental profession has been fully appeased by the responses, reviews and criticisms to, and of, Dr. Hunter, published in the various and several American dental journals.

Then, when we shall have fully recovered from our righteous rage, let us discuss the question: "Is there any truth in what he said?" or rather in what the *Current Literature* man said that he said, for in the

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last analysis there is little doubt that our professional brethren have been more angered by what was imputed to Dr. Hunter, than they ever would have been by what he really did say.

The very title of the *Current Literature* article is grossly misleading, and gravely misrepresents Dr. Hunter's position. The original paper can be found in the *London Lancet*, of January 14, 1911, and would be profitable reading for all dentists. The title is, "An Address on the Rôle of Sepsis and Antisepsis in Medicine." It is a lengthy disquisition on the subject matter, and discusses the relative fields of general surgery, medical practice, and dentistry, though in regard to the last the writer's comments are aimed more particularly at that limited part of dentistry known as "Crown and Bridgework."

Dr. Hunter nowhere denounces either dentistry *per se*, or American dentistry particularly.

After describing the somewhat appalling results which he has noticed as sequellæ of ill-constructed and ill-advised bridgework, he mentions sarcastically, "The pride which the dentist responsible for it feels in his high-class 'American work.'" The context and the quotation marks clearly indicate that Dr. Hunter is not denouncing American dentistry, but a spurious counterfeit thereof, which is advertised to the confiding public of his country under that name. Later on he does say that, "To gold-cap a healthy or diseased tooth in order to beautify or 'preserve' it is a negation of every one of these truths." Do we deny this? Then he adds that in his observation, in no country is this more common than among Americans, and in America. Is there any libel in that? It is not very long ago that a stage-manager in New York announced that no member of the chorus having conspicuous gold crowns could have place in the front row of his ensembles.

That Dr. Hunter is not "denouncing dentistry," nor the work of "even the best dentists," as has been attributed to him, is abundantly shown in the following quotation:

"The problem is an important one for the dental profession, and its solution an important one in the interests of public health, especially of our school children, 30 to 50 per cent. of whom suffer from dental and oral sepsis, and its tonsillitic, pharyngeal, glandular, and other effects. For while a large body of that profession are engaged in dealing *successfully* (italics ours) with the difficult problems of dental disease and of



oral sepsis, another body is no less steadily engaged in promoting sepsis of the worst character and degree by ignoring the fundamental truths connected with the anatomy, physiology, and pathology of the tissues with which they deal."

No one with any sense of justice can read this and deny that Dr. Hunter has fairly discriminated between the best and the worst practitioners of dentistry. Nor can anyone, in this view of his article, and having recovered from the rancor aroused by the misrepresentations of the sensational writer in *Current Literature*, once again read over, even the passages quoted in that magazine and not admit that Dr. Hunter has not overdrawn his picture; that such instances of dental malpractice are all too common, and *enfin* that Dr. Hunter has done us a kindness rather than an injury in calling attention to it. Even the saffron-hued "review" in *Current Literature* may produce some good, if it but arouse within the bosom of the dear public a wholesome caution in their choice of dental attendants, or a realization of the dangers which may beset them when seated in the chair of the man who advertises that he "inserts teeth without plates."

In any event, as a body of professional men avowedly devoting our lifework to the preservation of the health of our patrons, instead of rushing into print with self-laudatory asseveration, and intemperate invective against Dr. Hunter and the writer in *Current Literature*, would it not be more modest, more dignified, and perhaps more profitable to dispassionately consider the facts in order to determine to what extent this "septic dentistry," as Dr. Hunter terms it, may actually exist?

Dr. Hunter graphically describes the "septic dentistry," which he tells us has been responsible for serious ills in cases which have been observed by him. But elsewhere in his address he charges that the regular medical practitioner is also sadly at fault, or else woefully ignorant in his treatment of patients without due regard to the dangers from sepsis, and especially of oral sepsis. The general surgeon likewise comes in for his share of criticism. Dr. Hunter accords him all credit for his antiseptic precautions in guarding the actual field of his operation. Of the surgeon, he says:

"No precaution is too minute, no duty, however trivial, appears to him as such in the attainment of his great object. He renders these services, he observes these precautions as faithfully and as strictly in the

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case of the outcast admitted from the poorest slum as he would to the highest personage in the land."

The writer pauses here to ask if this quotation from Dr. Hunter is not an excellent word picture of the truly professional surgeon. Would it not be well to print these words and hang them framed in every dental office as an inspiration to dental surgeons, especially when treating root canals for poor patients?

After thus lauding the surgeon for guarding against the introduction of organisms into the body as a result of his operation, he criticizes him for overlooking, or at least shirking responsibility for, organisms that may be already present prior to his operation, especially within the oral cavity. He says:

"And yet unknown to him (the surgeon) and unnoted by him, he may be allowing his patient to retain a degree of sepsis, in the mouth, which would receive his immediate attention were it found anywhere else."

Let us then absolve Dr. Hunter of the charge that he has "denounced American dentistry," and endeavor to measure the extent to which "septic dentistry" may fairly be chargeable at our door.

That such an investigation cannot but be advantageous is readily shown by a single incident in the history of dentistry in New York City. About ten years ago a prominent physician rather startled the local profession by reading a paper before a body of dentists in which he charged that a seriously large number of persons, within his individual hospital experience, had *died of septic pneumonias*, induced by tooth sockets neglected after extractions. He pointed out that teeth are commonly extracted because of diseased conditions, and that to remove the tooth, and then leave the infected socket to its own resources, is contrary to correct surgical procedure. He made his picture sufficiently convincing to cause a complete revolution in the extracting methods of the dentists of the Metropolis.

Does Septic Dentistry Exist?

Much the same situation confronts us now. Another physician tells us of the evils that he has seen resulting from dental malpractice. What wots it that he may be unfamiliar with the best modern dental methods? The point of importance is that it should ever have been possible for him to have any true foundation whatever for such complaint.



But Dr. Hunter is not the first who has called attention to this condition of affairs. Dentists, even before the surgeons and physicians, made use of the X-rays as an aid to diagnosis, and very quickly we began to "see" things that were as unwelcome as they were unexpected. Long had we proudly believed that we could, and did, fill all root canals to their ends, or at least almost all, almost to their ends. But with the installation of X-ray machines, Morton, Kells, Van Woert, Price, and others began to create a grave doubt on this score.

**Root Canal
Fillings.**

In 1901, on April 1st (aptly enough), Weston A. Price delivered an illustrated lecture before the Cleveland Dental Society (ITEMS OF INTEREST, June, 1901, p. 458-472), demonstrating, "Practical Progress in Dental Skiagraphy." He published 85 radiographs, of which 35 show alveolar abscesses on filled teeth. There are 30 examples of imperfect root fillings which resulted in septic infections; worse yet the majority of these are on single-rooted teeth. Commenting thereon Dr. Price said:

"We will now turn our attention to the dentists' graveyard, root canal fillings, where so many cover up defective, careless work, trusting it will never come to light, and often reminding the patient that when this tooth gives trouble again it will have to be extracted. Humanity should thank God for a new light that will go into these dark places and show up what is often criminally careless or wilfully bad work in filling roots. True, it is often impossible to properly fill roots, but if all were as well filled as possible, those imperfectly filled would be only those with so small a canal or so little of it unfilled that the woes of humanity from this source would be infinitely less than they are."

One would suppose that some improvement in methods would have resulted from such an *exposé*, and the more general utilization of radiography, yet in July, 1908, seven years later, Dr. M. L. Rhein delivered a similar illustrated lecture before the New Jersey State Dental Society (ITEMS OF INTEREST, November, 1908, p. 833-855). Dr. Rhein published 46 radiographs showing abscesses and other septic sequellæ of incorrect root work and improper crown and bridgework. What was of more importance, he described a technique, which, aided by radiography, had enabled him to cure the septic troubles and to correctly treat and fill the roots which previously had been failures in other men's hands. That

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such roots can be correctly filled was abundantly shown by his radiographs taken after root filling.

In the same issue editorial comment was made upon Dr. Rhein's paper, from which the following quotation may be timely:

"The complete removal of canal contents has been the bugaboo of dentists since dentistry began. Perhaps no single operation has been more written upon, and yet with the hundreds of methods which have been described as adequate, even to-day, if a man dare say that he can reach the apices of even the majority of tooth roots, not a few of his hearers will believe that he is either self-deceived or else a wilful falsifier and a braggart. Yet certainly it is high time, for the honor of American dentistry, that this attitude should pass and that root canal treatment should be as skillfully and as successfully done as are other operations, for there is nothing in dental practice of so great importance. Of what advantage can it be to a patient for a practitioner to insert a perfectly matched porcelain inlay, or a perfectly occluded gold inlay, or a marvelously constructed bridge, if the canals of the supporting teeth have been inefficiently cleansed and filled?

" 'The operation was a success, but the patient died,' is the sneer that is often cast upon the general surgeon. Is it any better to have it said of the dentist: 'His bridge was splendid, but the roots abscessed?' "

On November 9, 1909, Prof. I. N. Broomell delivered an illustrated lecture before the First District Dental Society of New York City, entitled, "The Adventitious Effect of Large Masses of Gold in Contact with Tooth Tissues" (*Dental Cosmos*, April, 1910, p. 389-403). Dr. Broomell discussed the insertion of large gold fillings near to living pulps, as well as the placing of gold shell crowns without removal of the pulp, and he says:

"As a result of the microscopic study of a number of cases, it is proposed to show that almost invariably the pulp tissue, and as well the enamel, dentin, and alveolo-dental membrane, are all more or less affected in various ways by such unnatural surroundings. Among the morbid effects produced are hyperemia of the pulp, dry gangrene of the pulp, calcification of the pulp tissue, sclerosis of the blood-vessels of the pulp, atrophy of the pulp, pulp nodules, secondary dentin, expansion of the dentinal tubules, with corresponding bulging of the dentinal fibers, pathologic pigmentation of the enamel and dentin, non-carious destruction of the enamel, as well as destruction by caries and perhaps a molecular change in this tissue. Any one of the foregoing may be the primary affection, after which a train of pathic conditions may ensue."



This paper, by Dr. Broomell, clearly demonstrates by the clinical histories recounted and the beautiful photomicrographs published that serious pathological conditions are to be expected from the all too common practice of "conserving" (sic?) pulps, which should be removed, and which are left in place because the dentist confesses to himself (privately) his inability to aseptically treat and fill the root canals; for which reason he fills, crowns and bridges over doomed or dying pulps, ignorant or else unmindful of just such septic results as are now complained of by Dr. Hunter.

A few months later (ITEMS OF INTEREST, October, 1910, p. 754-755) Dr. Herman E. S. Chayes published an article entitled, "Empiricism in Bridgework," in connection with which he published illustrations made from photographs of sixteen pieces of bridgework. Of this class of work he says:

"At best one is brought face to face with results that are unsatisfactory, incomplete, unwholesome and unclean, etc., etc." Of the specimens from which the illustrations are made, he says: "These specimens are not the work of all-around incompetents; authors, clinicians, professors of prosthodontia figure among those at whose doors the existence of these specimens may be laid."

Here, then, we find not a "denunciation of American dentistry by an English physician," but an arraignment of American dental incompetency by four American dentists. A man once asked another, "Why are you so angry because Jones called you a liar?" "That is not what makes me mad," was the reply; "I am mad because he proved it."

The dentists of this country are "mad" because of an article in *Current Literature*, which really misrepresents Dr. Hunter, yet they did not lose their tempers when Drs. Price, Rhein, Broomell and Chayes, not only criticized American dentistry, but proved their contentions with their radiographs, photomicrographs and photographs. The present irritation arises perhaps because of the fact that the latest criticism appeared in the secular press.

It is not the writer's intention to leave the impression that such evils as are here described are representative of typical American dentistry. Quite to the contrary, no one better than he knows that perfectly scientific, thoroughly aseptic, and entirely sanitary dental operations are done

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daily by thousands of dentists in this country. Yet it is likewise true, and pity 'tis that 'tis true, that thousands of other dentists do exactly that sort of work which Dr. Hunter so aptly terms "septic dentistry."

Perhaps the great underlying reason of this may be found in the fact that neither the surgeon, the physician, the dentist, nor the patients themselves fully realize the dangers that threaten the whole body if the oral cavity be a secret storage place for "oral sepsis." When the people come to understand that their very lives depend upon sound teeth in a clean and healthy mouth, then, and not till then, will they cheerfully pay an adequate fee for competent dental service, and in that day more dentists will practice, because they can then afford to practice thoroughly "aseptic dentistry."

Disclaimer.

In the editorial in the September number occurs the following passage: "Between the Birmingham and Denver meetings Dr. Brown conducted a correspondence with the secretaries of State societies, asking that State societies express their wishes in regard to the National. Dr. Brown's report, given at Denver, was unsatisfactory, few State societies having evinced much interest in the National."

It appears that this has been construed into a criticism of Dr. Brown, and the language has been twisted to mean that Dr. Brown's work in regard to reorganization was unsatisfactory. Nothing was farther from the writer's thought than to criticize Dr. Brown's efforts to obtain some expression of opinion from the State societies, for no one was better informed as to the vast amount of unappreciated work done by Dr. Brown.

All that was meant was just what was said; the report was unsatisfactory because few State societies evinced much interest in the National. This was unsatisfactory, but not necessarily discouraging. The American Medical Association is now a great success, but the attempt to organize that great body met the same apathy in State Medical Societies; so much so that men were regularly engaged to visit and lecture to, and plead with, the State societies to co-operate in organizing a great National society.

In Cleveland there were encouraging signs that the State Dental Societies are at last taking some interest in the National. Twenty-four



State societies sent delegates to speak for them. Twenty-two voted in favor of "reorganization along the lines of the American Medical Association," but will all of these twenty-two States now express the desire to become component societies in the reorganized National, or will the State societies be so busy with their own local affairs at their next annual meetings that they will forget all about passing a resolution in regard to joining the National in a body? It is this sort of apathy which has kept our National Association small, but the opportunity is now at hand for the formation of a dental body which, within its sphere, will be as important, as useful and as powerful as is the American Medical. Moreover, unless all signs fail, while a few State societies may be too occupied with local matters to vote for affiliation with the rest of their professional confrères beyond their own borders, a sufficient number of States will ask for component membership next year to make the reorganization successful. Within a few years thereafter, all will come in.





SOCIETY ANNOUNCEMENTS

National Society Meetings.

NATIONAL DENTAL ASSOCIATION, Washington, D. C., September 10, 11, 12, 13, 1912. Secretary, Dr. Homer C. Brown, 185 E. State St., Columbus, O.

CANADIAN DENTAL SOCIETY AND ONTARIO DENTAL ASSOCIATION, union meeting, Hamilton, Ont., June 3, 4, 5, 6, 1912. Secretary, J. A. Cameron Hoggan, Federal Bldg., Hamilton, Canada.

INSTITUTE OF DENTAL PEDAGOGICS, Chicago, Ill., January 24, 25, 26, 1912. Secretary, Fred W. Gethro, 917 Marshall Field & Co. Bldg., Chicago, Ill.

AMERICAN SOCIETY OF ORTHODONTISTS, Chicago, Ill., July 5, 6, 7, 1912. Secretary, Dr. F. C. Kemple, 576 Fifth Ave., New York.

Institute of Dental Pedagogics.

The next annual meeting of the Institute of Dental Pedagogics will be held in Chicago, January 24, 25 and 26, 1912. (Notice change in dates.)

The officers and committeemen have arranged a program that will be of unusual interest to every dental teacher. In addition to the excellent papers and instructive exhibits, one day has been set apart for the inspection of the Chicago schools, where all departments will be in operation.

A detailed program will be given in the next issue of this journal.

FRED W. GETHRO, Secretary.

Ohio State Dental Society.

The 46th annual meeting of the Ohio State Dental Society will be held in the Southern Hotel, Columbus, December 5, 6 and 7, 1911.



The following program, while not giving the exact titles, indicates the subject matter of the various papers:

Dr. A. O. Ross, Columbus, President, "Most Frequent Causes of Mortality among Dentists Compared with Other Professions and Means of Prevention."

Dr. H. T. Smith, Cincinnati, "Germicides in Dentistry."

Dr. F. W. Gethro, Chicago, "Cavity Preparation for Fillings and Inlays."

Dr. H. Printz, St. Louis, "Local Anesthetics in Dentistry."

Dr. C. R. Turner, Philadelphia, "Artistic Dental Prosthesis."

Dr. J. K. Douglas, Sandusky, "Cast Gold Inlays vs. Gold Fillings."

Dr. Henry Barnes, Cleveland, "Sweated Gold vs. Cast Gold Inlays."

Dr. L. E. Custer, Dayton, "Porcelain Inlays vs. Silicate Cement Fillings."

The above splendid program of papers, together with the usual large list of clinics, insures something of interest to every member of the profession.

Much more commodious quarters have been arranged for the sessions of the society, insuring ample room for all.

All reputable dentists are cordially invited.

F. R. CHAPMAN, Secretary.

Indiana State Board of Dental Examiners.

The next meeting of the Indiana State Board of Dental Examiners will be held in the Capitol, Indianapolis, beginning Monday, January 8, 1912, and continuing four days. All applicants for registration in the State will be examined at this time.

No other meeting will be held until June, 1912. For further information, apply to the Secretary.

F. R. HENSHAW, Secretary.

507-8 Pythian Bldg., Indianapolis, Ind.

G. V. Black Dental Club.

The G. V. Black Dental Club will hold a mid-winter clinic in St. Paul during February, 1912. Definite dates will be given in next issue of this magazine.

DR. R. B. WILSON, Secretary.

American National Bank Bldg., St. Paul, Minn.



Third, Fourth, Ninth and Westchester County Dental Societies.

There will be a union meeting of the Third, Fourth, Ninth and Westchester County Dental Societies, held at Schenectady, November 21 and 22, 1911.

An excellent program has been arranged, including prominent essayists and instructive chair and table clinics.

A large number of exhibitors have already engaged space. There will be a banquet on the evening of the first day. Cross these dates from your appointment book, as it will be a holiday well spent.

EARL TIMESON.

Schenectady, N. Y.

Fifth and Sixth District Dental Societies.

The 43rd semi-annual meeting of the 5th and 6th District Dental Societies of the State of New York will be held November 17 and 18, 1911, at the Onondaga Hotel, Syracuse, N. Y. All ethical members of the profession are cordially invited to attend.

J. N. GARLINGHOUSE, Secretary, Fifth District.

Pennsylvania State Board of Dental Examiners.

The next regular meeting of the Pennsylvania State Board of Dental Examiners will be held in Philadelphia and Pittsburg, on December 13, 14, 15 and 16, 1911. For application blanks address Dr. Nathan Shaeffer, Superintendent of Public Instruction, Harrisburg, Pa.

ALEXANDER H. REYNOLDS, Secretary.

4630 Chester Avenue, Philadelphia.

Rhode Island Board of Registration.

The Rhode Island Board of Registration in Dentistry will meet for the examination of candidates at the State-house, Providence, R. I., Wednesday, Thursday, and Friday, December 27, 28 and 29, 1911. Application blanks and particulars may be obtained from

H. L. GRANT, Secretary.

1025 Banigan Bldg., Providence, R. I.